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31 July 1979

USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

No. 41

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31 July 1979

USSR REPORT

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

No. 41

This serial publication contains articles, abstracts of articles and news items from USSR scientific and technical journals on the specific subjects reflected in the table of contents.

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I. DEVELOPMENT AND PRODUCTION OF COMPUTERS AND CONTROL EQUIPMENT

A. Problem Areas

Translations of Articles

THE PRESENT AND FUTURE OF POCKET CALCULATORS

Moscow KOMMERCHESKIY VESTNIK in Russian No 23, Dec 78 pp 21-22

[Article by I. Konstantinov]

[Text] The word "mini-calculator" became popular not so long ago. In 1976 the first Soviet-produced instruments appeared on the counters of stores. In 1978 the commercial organizations of the union republics have sold 984,000 mini-calculators. In 1979 it is planned to produce 1,350,000 units.

All this is gratifying, because such a helpful device is needed by everyone engaged in calculations. But meanwhile the demand for mini-calculators still remains very low. This can be explained primarily by high retail prices and the far from excellent quality and appearance of the articles.

In connection with that the All-Union Pavilion of Best Examples of Consumer Goods of the USSR Ministry of Trade jointly with Glavkul'tbyttorg [Glavnoye upravleniye torgovli tovarami kul'turno-bytovogo, khozyaystvennogo naznacheniya i galantereyev--Main Administration for Trade in Goods for Cultural, Household and Farm Purposes and Haberdashery] of the same ministry and the Ministry of the Electronic Industry reviewed the assortment and quality of the mini-calculators produced by plants of this country.

Seven enterprises are manufacturing eight mini-calculator models operating with digital decimal numbers and bearing the brand name "Elektronica." Of them, five models (BZ-09M, BZ-14M, BZ-23, BZ-26 and BZ-30) are intended for arithmetic and very simple mathematical calculations, and three models (BZ-18A, BZ-18M and BZ-19M) for scientific, technical and engineering calculations. This is practically the entire assortment of calculators that has been put on the market.

But the inadequate assortment is not the only minus discovered in the course of the review.

Unfortunately, the technical policy of the Ministry of the Electronic Industry, the leading one in the production of mini-calculators, in the area of the development, standardization and introduction into production of new types of articles, convenient, reliable, durable in operation and, finally, esthetically attractive, is not effective. As a result the quality of Soviet mini-calculators does not completely meet the requirements set for them.

Some of the reasons for this situation, evidently, are concealed in the absence of a state standard for mini-calculators. It is very indicative that mini-calculators with identical use properties and similar functions are made with different basic circuits and different parts (junctions, plugs, power units, etc), although standardization is not only possible but necessary here.

It is hard to read the indications on the scales of mini-calculators. The keyboard symbols are not always fortunately placed on the models, and after long use the symbols on the keys wear off and the markings on the casing are not always identical and are not very legible.

On the models BZ-09M and BZ-14M the indicator readings are poorly visible, and "false" numbers light up. The mounting plates are seen through the protective glass of the indicators of the same models, and also of calculators BZ-26 and BZ-18M. In models BZ-09M and BZ-14M the casing is insufficiently strong.

In some models there is no designation of polarity for the attachment of batteries (for example, model BZ-26), but in all the instruments it is convenient to change the batteries. For example, in models BZ-30 and BZ-18A it is possible to destroy the plant seal while changing power sources.

The current sources themselves are far from perfect. The continuous working time of the mini-calculators using batteries is limited to 2 or 3 hours, which naturally is insufficient.

Soviet "pocket computers" differ disadvantageously from the better foreign models in their large dimensions and unattractive external appearance. The model BZ-19M has a casing of archaic form and design. On the box in which the "Elektronika BZ-30" mini-calculator is packaged it says, "Ultrathin." Although that calculator actually is not large in thickness in comparison with other models, it seems that such a designation is out of order, because mini-calculators can be still thinner.

The operating instructions of the articles are hard to decipher. They are poorly formulated and at times do not contain electrical and assembly diagrams.

The packaging of the mini-calculators also leave much to be desired: the boxes are of low-grade cardboard with poor faded printing. The cases are made of poor-quality artificial leather and are poorly designed. Such is the casing of model BZ-23.

Warranty repairs and the servicing of mini-calculators have not been organized everywhere. Repair shops are poorly supplied with spare parts. For mini-calculators in order to lighten the work of people and not to create additional difficulties, it is necessary for the ministries of household servicing of the union republics to organize a network of warranty repairs and servicing of mini-computers.

Reassuring is the statement of a representative of the Ministry of Electron Industry in summing up the results of a survey, that the entire presented collection of mini-calculators will be removed from production in the future. I would like to hope that the shortcomings of the preceding will be eliminated from the "pocket computers" of the future.

The production of new models intended for schoolchildren and students as regards price and functions will help to increase the demand for mini-calculators. And then it will be possible to say with confidence that mini-calculators occupy a firm place in our lives and will become really reliable and convenient aids.

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CSO: 1863

POOR UTILIZATION OF COMPUTERS BY LENINGRAD TECHNOLOGICAL INSTITUTE CRITICIZED

Leningrad LENINGRADSKAYA PRAVDA in Russian 18 Mar 79 p 2

[Article by Ye. Solonenko: "In the Fog of Confusion--Why Is Computer Equipment Being Poorly Utilized at LPI imeni Lensovet"]

[Text] When was this computer delivered to the Leningrad Technological Institute imeni Lensovet? According to bookkeeping data, it was delivered more than 2 years ago. One of the Vuzes was unprepared to accept it and until the walls were torn down in an emergency procedure and a room was prepared, parts of the machine had to lie scattered about the institute's yard. And since the room was not prepared in time, the organization which was supposed to start up and debug the computer crossed LTI off its plan of operations. An official report on introduction of the machine into operation was also not formalized (although it was supposed to have been signed much later--6 months after delivery of the computer to the organization). And we are talking about one of the most modern computers, the YeS-1022!

The machine is now counted in experimental operation. Specialists who are officially allotted for other computers (due to which part of the machines had to be transferred from the established two-shift to one-shift operation) service it. This includes several persons, "working," according to documents, on the Odra-1304, which has not been at the institute for 2 years.

What confusion! Incidentally, this is typical for the entire subdivision which combines these specialists and these machines. Its profiles, tasks and even its name are lost in foggy confusion. It is mentioned in conversations at the institute's computer center and in LTI documents as the Interdepartment Laboratory of Computer Technology, but it generally does not exist for the ministry since it was developed by an intra-institute order.

"True, we have a joke going around, true not a happy one, that our laboratory, like Cheburashka, is some unknown animal," explains the deputy chief of computers B. M. Artem'yev. "Actually, the laboratory's status is undetermined, the same as the official duties of the workers: it is unclear who is responsible for what. And all this has been dragged out for many months."

Let us add that the duties not only of the workers but of the managers as well are unclearly defined. Actually, there is a laboratory chief--N. A. Shiryayev, but he states: "I am mainly involved with what concerns the equipment and machines." And there is yet another manager--V. S. Makarova, the possessor of an absolutely incomprehensible and even secret position in some manner: assistant to the institute pro-rector on new technology on social principles.

What kind of position this is and what rights and duties have been entrusted to V. S. Makarova can only be guessed at. They explained to us clearly and unequivocally at the rectorate: her functions are equipment acquisition (comrade Makarova's capabilities of delivering new equipment, punch cards, magnetic tape and miscellaneous "shortages" at the ministry are implied here), while the position of assistant to the pro-rector was thought up "for representation." The secretary of the faculty party bureau G. V. Ivanova has a different opinion: "We do not understand Makarova's role in the interdepartmental laboratory. It has an official chief, but Makarova rather than he determines the 'policy'." And Valentina Stepanovna Makarova herself does not tend to limit the sphere of her activity to "acquisition problems:" "My functions include all organizing problems on creation of an interdepartmental laboratory."

When there is no clearly determined management and when the official duties are unclear, one can hardly expect high discipline from members of the collective. Should one be surprised that in the given case the subordinates frequently simply refuse to perform the orders of the laboratory chief and place conditions on him; he was even forced to convert to written form of communication with two workers: "I give them a written order, but they either answer or do not answer." (!!!).

Yes, this microclimate car in no way be called healthy. One of the laboratory workers supplements the picture: "There is no order in the work at all and none is foreseeable in the future. The collective is becoming nervous, people are beginning to doubt the competence of the immediate management and instability is constantly increasing." Actually, 13 persons (13 of 75!) left the laboratory during 1978 and 11 were hired by the laboratory. But whereas the fresh supplement is comprised mainly of laboratory workers, the deputy chiefs of computers, the engineer-economist and shift chief--that is, qualified personnel--have doubled.

The faculty party bureau has raised the alarm: approximately 3 months ago at its meeting, it considered the problem of the efficiency of utilizing the laboratory and the prospects for its development. The conclusions were not comforting. The party bureau members gave a true, principal analysis of the situation at the laboratory and adopted the appropriate resolution. But what has actually changed since then? According to extensive calculation--almost nothing.

There is still essentially no Interdepartmental Laboratory of Computer Technology at the institute. There are people and there are machines, but there is no independent subdivision which could perform the tasks of the computer center which would assist all the faculties and departments in organization and conducting the academic process and scientific research. Is this laboratory generally needed in a large vuz? Undoubtedly. The modern academic process, training of specialists and the activity of lecturers and numerous departments rely more and more on computers. The computer now penetrates all spheres of the vuz's activity: in setting up the academic practical work of the students, in compiling mathematical models of different processes and automation of scientific experiment and finally in business affairs: various "Vuz" subsystems of the ASU are being introduced more and more widely into the daily life of higher education.

But as we can see, a mass of problems which are now suspended in the air here at LTI is related to creation and operation of this laboratory. The faculty party bureau was also unable fundamentally to affect their solution. This may be explained to some extent by the fact that we are talking about a generally institute subdivision which competes directly with the rectorate. But why has the LTI party committee, knowing the unfavorable situation at this laboratory, not adopted decisive measures and why has the rectorate tolerated for so long this disorder in a very important and necessary matter? Incidentally, the responsible workers of the rectorate are in an optimistic mood: "Yes, of course, the situation is very complex. But the personnel problem is now being resolved and quite recently they began to develop job instructions." These answers now sound quite unconvincing: "The shakedown period" is dragging out too long and the time has long come to change from words to deeds. The causes which interfere with setting up the laboratory could have been eliminated long ago with a different attitude of the rectorate and the party committee of LTI toward the problems of this collective if organizing and purely human questions had not been lost behind problems of equipping with new technology.

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CSO: 1863

USSR

THE DESIGNER'S COLLABORATOR

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 3 Apr 79 p 2

MYASNIKOV, V., dr in technical sciences, Director of the Computer Technology and Control Systems Department, State Committee of the USSR Council of Ministers for Science and Engineering

[Abstract] A few years ago a letter was received from the Leningrad Metal Plant with the paradoxical statement that during the tenth Five-Year plan period and in the beginning of the eleventh one it will be possible to produce more efficient and reliable turbines without raising the level of automation of engineering and manufacturing activities. In the present paper this statement is, in a way, refuted and the creation of an automated system for design, construction and technological preparation of production (SAPR) by mathematical methods with the aid of a computer and an adequate data bank is justified. Its indispensability for programming of scientific research and engineering design, especially intensive in the machine building industry, is documented by statistics indicating its tremendous effect on cost reduction by elimination of errors and rework, its effect on streamlining the interdepartmental coordination, and on utilization to the fullest extent of accumulated experience. To be sure, creation and implementation of this automated management system will require the assistance of the academic community and some reorganization of the enterprises engaged in this under the direction of the State Committee of the USSR Council of Ministers for Science and Engineering.

B. Production Plants

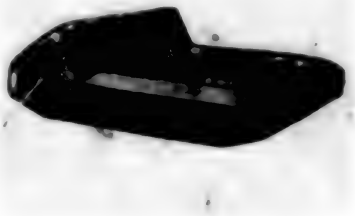
Translations of Articles

USSR UDC 681.321:657.1

'ISKRA' KEYBOARD CALCULATOR

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian [New Devices and Means of Automation] No 4, 1979 p 23

[Text] The "Iskra-210" Keyboard Calculator is intended for the execution of the simplest planning, economic and statistical accounting calculations in bookkeeping, planning, economic and other departments of enterprises and organizations. It is a desk top calculator, with a modular structural design using printed circuits.



The operations performed (with the decimal point): addition, subtraction, multiplication, division and operations with a constant. The maximum number of places in the numbers and results is 12 decimal places. The decimal point can be placed in any position. The average time for performing the operations, in seconds: addition and subtraction, 0.03; multiplication and division, 0.35. The data display uses electroluminescent devices. The power consumption is 8 watts. The overall dimensions are 215 x 220 x 60 mm, and the weight is no more than 2 kg.

It is produced by the Penza "Schetmash" plant.

UDC 681.171

'ISKRA-341' ELECTRONIC MON TOR AND RECORDING REGISTER

Moscow PRIBORY I SISTEMY UI RAVLENIYA in Russian [New Devices And Means of Automation] No 4, 1979 p 2:

[Text] The "Iskra-341" Electronic Monitor and Recording Register is intended for mechanizing the documentation of payment operations and automating the accounting in savings banks. The machine documents payment and accounting operations, provides for separate accounting for totals according to types of payments, subtotals for several payments, totaling withdrawals, as well as the addition and subtraction of numbers both with the receipt of the summarizing document and without it. Furthermore, it provides for printing out a payment blank with the total and the code of the payment ndicated, an accounting sheet with the totals marked according to types of payments, a payment code and an overall total for all payments, a summariz ng document when performing subtraction and addition operations, and also rovides a display for the operator of the information fed in, the code f r the type of payment, the total, deposited by the customer, withdrawals an totals.

The information is fed in fr n a 10 key digital keyboard. Number of registers: 10 totaling registers and 3 monitor ones. Number of places in the registers: eight for the su aing and four for the monitoring registers. The productivity is 200 banki ng transactions per hour. The power consumption is 200 watts. The overs l dimensions are 430 x 48 x 435 mm, and the weight is 50 kg.

It is produced by the Kursk " chetmash" plant.

UDC 681.171

'ISKRA-1252' COMPUTER COMPLEX

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian [New Devices And Means of Automation] No 4, 1979 p 23

[Text] The "Iskra-1252" Computer Complex is intended for performing scientific, engineering and mathematical calculations of intermediate complexity at scientific-research institutes, design offices, and institutions of learning. Included in the equipment complement are the program controlled "Iskra-1250" keyboard computer, and the following units: the "Iskra-005-21" magnetic card read and write unit; the "Iskra-005-30" cassette magnetic tape store; the "Iskra-001-41" narrow tape printer; interfaces with the "Iskra-014-01" graph plotter, as well as the PD114-002 potentiometric X-Y plotter. The complex performs the following operations: addition, subtraction, accumulation, multiplication, division, sign change, finding the absolute value, raising to a power, extracting a square root, converting degrees to radians and radians to degrees, isolating the integer part of a number, computing exponential, trigonometric and hyperbolic functions, finding the natural logarithm of a number, the operations of sampling and transferring to memory registers and index registers, programming operations and input-output operations for peripherals. The memory organization of the complex includes a main memory, which is automatically distributed between the program and subroutine areas, memory registers (for the initial data and results) and stacks of 876 bytes. It is produced by the Kursk "Schetmash" plant.

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CSO: 1863

C. Hardware

Translations of Articles

USSR

ELEKTRONIKA B3-26, B3-19M MICROCALCULATORS ADVERTISED FOR SALE

Moscow KOMMERCHESKIY VESTNIK in Russian ("Advertisement--Complex Calculations Prove Extremely Simple When Microcalculators Are Used") No 2, Jan 79 p 29

[Text] The Elektronika B3-26 can carry out the four arithmetic operations with signed numbers, compute percentages, extract square roots, and store information in its internal memory.

Its self-contained power supply consists of 4 AZ16 "Kvant" units (or 220-volt alternating current can be used via the removable BP2-1 power supply unit).

The B3-26 is 140 X 80 X 27 mm in size, weighs 360 g., and costs 115 rubles.

The Elektronika B3-19M can perform the four arithmetic operations with signed numbers, carry out logarithmic operations, raise numbers to a power, and computer trigonometric and inverse trigonometric functions, square roots, etc.

A self-contained power supply is provided by 4 batteries of the D-0, 558 type; otherwise, power is provided by a 220-volt alternating current.

The B3-19M is 166.5 X 86 X 41 mm in size, weighs 400 g., and costs 240 rubles.

CSO: 1863

COMPUTER GAMES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 24 Jan 79 p 4

[Article: "Computers as a Gift"]

[Text] An exhibition "Games and Technology," at which more than 80 exhibits was represented, was opened in Moscow at the Polytechnical Museum during the first few days of this year, declared as Children's Year by the United Nations. Approximately 200 enterprises of our country showed their products at this exhibition, among which were many innovations. Today we talk about some of them.

Computers as a Gift

It is difficult to call this device a toy--after all, a real computer is offered to older children. It is capable of answering questions, of solving simple tasks posed to it and of being a partner in various games and even of being an examiner. The machine familiarizes one with the fundamentals of mathematical logic and the binary system of calculation.

The computer contains a control console, program plugs, jumpers and cards with figures and inscriptions. The power supply is from a battery of type 3336L.

The price of the children's computer is 9 rubles 80 kopecks.

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USSR

GOST 19770-78. COMPUTERS. SIX-DISC REMOVABLE CASSETTES. DESIGN, BASIC PARAMETERS AND DIMENSIONS

Moscow STANDART. EKSPRESS INFORMATSIYA in Russian No 9, 1979 p 19 [Report of alterations to standards for computer hardware]

[Text] The standard was developed in place of State Standard 19770-74 and affirmed by decree of State Standard dated 29 December 1978; it is effective from 1 January 1980 to 1 January 1985.

The purpose of the review was to bring the standard in correspondence with requirements of ISO 2864 in the section concerning basic dimensions and structural mutual interchangeability.

The new standard, in contrast with the current one: established the distance of the pin of the locking mechanism from the spindle lock flange (18.5 mm) and travel of the lock plunger from the flange to release the locking balls (13.8 $\pm$ 0.5 mm), the inner diameter of the working and sector disk, the maximum rate of rotation (2500 rpm), the moment of inertia of the cassette (57 $g \cdot m^2$); the length of the lock tail thread was reduced from 8.5 to 7.4 min.

Incorporation of the standard will permit improvement of quality and guarantee mutual interchangeability of parts of computers. Anticipated savings: about 100,000 rubles per year.

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CSO: 1863

USSR

HAND-HELD CALCULATOR: ELEKTRONIKA BZ-24G

Moscow KOMMERCHESKIY VESTNIK in Russian No 6, Mar 79 p 41

[Advertisement for new hand-held calculator]

[Text] A miniature device intended for individual use in performing the simpler mathematical calculations.

The display contains nine digits. The display is an LED type. The range of numbers is from $\pm 10^{-7}$ to $\pm 10^{8}$ minus one. Floating decimal. Operations performed: four arithmetic functions with sign change, storage in working memory, constant. Self-powered by AZ16 battery or by 220VAC 50Hz line using a BP2-1 adapter. Power requirements are no greater than 0.45 VA. Dimensions: 155 x 78 x 28 millimeters. Weight no more than 0.2 kg (without components). Retail price 65 rubles.

8617
CSO: 1863

Abstracts of Articles

USSR UDC 681.3.06:51

GRAPHICS PACKAGE FOR M-4030 COMPUTER WITH YeS-7064 AND A-5433 GRAPHICS DISPLAYS

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 88-89 manuscript received 21 Feb 78

BELOV, S. B., BOBKOV, V. A. and GOVOR, V. I., Vladivostok

[Abstract] Within the scope of the unionwide unified system, a graphics package was constructed for the M-4030 computer. It has a set of graphics terminals that now includes two YeS-7064 displays and two A-5433 displays (developed by NPO VUM [? Scientific Production Society for Computing and Control Machines], Kiev). The routine module developed for the A-5433 includes the following functions: 1) Forming the display file for each of the three display operating modes (graphical, textual and mosaic); 2) Identifying the image segments; 3) Editing images; and 4) Organizing the graphics dialog mode. The following are used as dialog information: 1) The code of the depressed key of the function keyboard; and 2) A table of auxiliary information which includes--a) The number of the specified light button; b) Naming indexes of the specified segment; c) Marker coordinates; and d) Coordinates of the specified graphics element. All package routines are stored as loading modules in a systems library at the direct-access computer facility. References 1 (Russian).

USSR UDC 681.5.012

METHODS OF TEST CHECKING MICROPROCESSOR DEVICES. A SURVEY

Riga AVTOMATIKA I VYCHISLITEL'NAYA TEKHNIKA in Russian No 6, Nov/Dec 78 pp 18-27 manuscript received 20 Apr 78

GOBZEMIS, A. YU. and UDALOV, V. I.

[Abstract] A review of the best known works on fault detection testing of microprocessor devices (individual LSI chips and functionally complete systems comprised of such chips). As a test object, the microprocessor unit is treated with either a systems approach where it is a unified functional device for which a test program is compiled, or a modular approach where test programs are compiled for separate blocks, and these individual programs are then unified in an appropriate manner to form a test program for the whole microprocessor device. Development of microprocessor test techniques has led to differentiation between the macrolevel and microlevel of checking procedures. On the macrolevel, the check is carried out by some sequence of micro-operations--a test microprogram--to verify execution of a given operational algorithm. On the microlevel the test programs are ordinary sequences of input signals and corresponding output signals and are used for detecting and localizing faults in registers, adders, memory units and the like. More study is needed on the particulars of operation of actual microprocessor units and their component modules to develop adequate models of these devices and their typical malfunctions. A study of the current state of techniques for structural testing of discrete devices shows that modular methods of test design have the best outlook. In the near future, it will be possible to include self-checking systems in microprocessors on the hardware level, which will have a considerable influence on test procedures. Further development of efficient testing equipment is needed, particularly logic analyzers and microdiagnostic testers. Along with development of algorithmic procedures, analog methods of checking must be developed on the basis of general-purpose computers and specialized testers. Figures 3; references 47: 24 Russian, 23 Western.

USSR UDC 681.324:519.248

INFLUENCE THAT UNRELIABILITY OF THE MAIN MEMORY HAS ON THE PRODUCTIVITY OF A COMPUTER SYSTEM

Riga AVTOMATIKA I VYCHISLITEL'NAYA TEKHNIKA in Russian No 6, Nov/Dec 78 pp 66-72 manuscript received 12 May (30 Jan) 1978

PETERSON, E. YA.

[Abstract] An examination is made of the influence that the volume of the main memory has on the capacity and reaction time of a computer system, and the behavior of speed characteristics is analyzed where there are failures of modules of the main memory. It is assumed that the computer system consists of an I/O subsystem, a processor with modular main memory and backing store organization, and also external memory devices. It is assumed that the system operates with a uniform flow of a fixed number of problems. The analysis is based on a closed three-phase queueing system model with exponential servers, assuming failures and restoration of individual modules of the main memory. Within this framework, expressions are derived for estimating the speed characteristics of a computer system in terms of the number of modules of the main memory and their reliability indices. Figures 6; references 6: 3 Russian, 3 Western.

USSR UDC 681.142

A NEW COMPUTER FOR SOLVING HIGHER-COMPLEXITY PROBLEMS IN MATHEMATICAL PHYSICS

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 93 No 1, Jan 79 pp 121-124

KRUGLIKOV, V. K. and NATROSHVILI, O. G., Georgian Polytechnic Institute imeni V. I. Lenin and Leningrad Institute of Precision Mechanics and Optics

[Abstract] A computer has been designed for solving 3-dimensional boundary-value problems with elliptic equations. It is an optoelectronic device with holographic data processing and storage. Operation in three independent orthogonal coordinates is made possible by the use of two laser beams, one deflecting the other, and two matrices. A simple algorithm of the solution of the problem

$$\sigma u(x,y,z) = F(x,y,z) \text{ in region } D$$
$$u(x,y,z) = G(x,y,z) \text{ on boundary } B$$

(ε denoting the elliptic operator) is shown and the solution is illustrated on the example of

$$\varepsilon u(x,y,z) = -1$$
$$u(x,y,z) = 0.$$

The article was presented on 17 Oct 78 by V. K. Chichinadze, corresponding member of the Academy of Sciences (Georgian SSR). Figures 1; tables 1; references 2 (Russian).

USSR UDC 621.327.25

CALCULATING THE REQUIRED CAPACITY OF A ZONAL BUFFER MEMORY FOR A DIGITAL COMPUTER

Riga AVTOMATIKA I VYCHISLITEL'NAYA TEKHNIKA in Russian No 1, Jan/Feb 79 pp 73-75 manuscript received 18 Apr 78

IVANOVSKIY, V. B.

[Abstract] The gap between users' requirements and available computer capacity can be narrowed by rationalization of the computing process, by proper selection of the servicing mode, and by providing the necessary memory capacity and structure. Here a digital computer is considered into whose buffer memory enter N message fluxes of various types subject to certain priority assignment. The message servicing time is regarded as a quantity with a random distribution and a finite mean value. The problem is to determine the number of messages of a type which can be stored in the appropriate memory zone so that the probability of another message of this type getting lost upon entering this zone will not exceed a given permissible level. The solution to the problem is based on the analysis of an embedded Markov chain, first for the case of relative prioritization and then extended to the case of absolute prioritization. The algorithm of determining the required capacity involves successive calculation of probabilities as messages are added to the memory. References 4: 3 Russian, 1 Western.

USSR UDC 681.323.5-181.4

A SPECIAL-PURPOSE MICROPROCESSOR FOR PARALLEL INTEGRATING COMPUTER STRUCTURES

Riga AVTOMATIKA I VYCHISLITEL'NAYA TEKHNIKA in Russian No 1, Jan/Feb 79 pp 76-81 manuscript received 18 Apr 78

KALAYEV, A. V., GUZIK, V. F. and PITERSKIY, A. I.

[Abstract] Special-purpose computers are needed for solving such problems as control of objects in real time, control of technological processes, simulation of intricate dynamic processes, forecasting and a few others. Homogeneous digital integrating structures (OTsIS) have already been developed for this purpose, on the basis of digital devices, integrators or resolvers, which implement the algorithm of numerical integration of the Stieltjes integral over a finite interval. Further development is aimed at producing program-compatible special-purpose microprocessor with the necessary software. Here the structure of such a microprocessor is shown which realizes T-operators of solving the system of Shannon equations for any of ten nonhypertranscendental functions. This structure consists of an input device and an output device with register switches in the commutator which realizes F-operators, an automatic operational unit and an automatic control unit. The basic logic and operational codes are also shown. A computer with such a microprocessor can be programmed just like a general-purpose computer so as to become compatible with one and, furthermore, in a higher-level language so that the procedure for constructing the Shannon equations becomes much simpler. Figures 4; tables 2; references 8 (Russian).

USSR

A MESSAGE FOR THE FUTURE: VARIANT 'X'

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 25 Apr 79 p 4

[Abstract] Yuriy Yefremovich Nesterikhin, corresponding member of the USSR Academy of Sciences and director of the Institute of Automation and Electrometry at its Siberian Department, explains the significance of the El'brus-2 computer. This new computer performs 100 million operations per second, while a best third-generation Unified System computer such as the YeS-1065 performs 4 million operations per second. The difference is a much greater capability and precision of image coding, extraction, reproduction and revision, in color on a television screen and automatically with keyboard control. It is thus possible to track an object under a microscope, to optimize the design of a printed circuit, for instance, and easily eliminate all nonoptimal variants "x," or to map the space flight of a fictional craft in a game.

Contributors to this capability are an adequate program storing computer memory, a graph plotter with feedback and an optical pencil, and optoelectronic converters. It should be possible to produce moving images too, but for this the computer will have to operate still faster.

D. Programming and Software

Abstracts of Articles

USSR UDC 518.74

SOFTWARE FOR 'KARAT' MICROFILMING UNIT

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 25-27 manuscript received 21 Feb 78

DEBELOV, V. A. and MATSOKIN, A. M., Novosibirsk

[Abstract] Software for the "Karat" microfilming unit, interfaced with the BESM-6 computer, was developed in the Computer Center, Siberian Division, USSR Academy of Sciences. The "Karat" unit software serves for microfilming in the SMOG graphics software. Features of the "KARAT" microfilming software include specification of the brightness, diameter and exposure time of the light spot, frame shift, mode of video terminal use and routines in readout of alphanumeric information. Another feature is the inclusion of equipment for reproduction and fragmenting of information in the frame and arranging frames from fragments. These purposes are served by the option to include the software fragment and frame archives in the external computer memory. The "KARA" microfilming unit is quite similar to the Benson-320 photoplotter. All equipment is programmed in ALGOL-BESM, AL'FA-6 and with the Dubna executive system. References 3 (Russian).

USSR UDC 681.3.058

DIFGOR--MEANS FOR INTERACTIVE GRAPHICS PROGRAMMING

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 38-41 manuscript received 21 Feb 78

MAKAROV, K. M., Novosibirsk

[Abstract] The package of DIFGOR routines for working with the YeS-7064 graphics display in the BESM-6 computer as part of the OS IPM (operational system of the Institute of Applied Mathematics) is an example of a graphics package. The DIFGOR package can be used with routines written in FORTRAN, ALGOL-GDR, MADLEN and BEMSh, part of the Dubna executive system. In its execution, the interactive graphics applied program involves user interaction at the display console with a computer program. Using a light pen, a function keyboard and special keys of the alphanumeric keyboard, the user directs the course of the program in forming and modifying the images on the display screen. The package subroutines are of three kinds: 1) Means for image construction and modification on the display screen; 2) Means for interfacting the user with the routines; and 3) Means for maintaining the autonomous functioning of the user with the display console. Pictures are displayed and modified by the following commands: "Begin picture;" "Set beam at point;" "Show point;" "Show line;" "Show line of symbols;" "Introduce marker;" and "End of set of commands." The screen of the YeS-7064 display is a rectangular area containing 1024x1024 addressable points. References 2 (Russian).

USSR UDC 681.3.068

AUTOKOD LANGUAGE FOR YeS-7064 GRAPHICS DISPLAY

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 47-50 manuscript received 21 Feb 78

YANCHUK, T. S., Novosibirsk

[Abstract] Not a general-purpose graphics language, AUTOKOD language serves for fitting AUTOKOD operators into routines written in FORTRAN, thus making FORTRAN into a computational language. In execution, a task for the Dubna-executive system is fed into a system, containing the AUTOKOD operators. AUTOKOD-segments, or sequents of FORTRAN or AUTOKOD operators framed by KADR and KONETS operators, can be nested in any of the SUBROUTINE subroutines or in the leading PROGRAM routine written in FORTRAN. Task processing is in

two stages. The preprocessor is in ARMO language; the YARMO-text in an application with a BESM-6 computer w. s 9000 BESM-6 words and was translated into an object code with a volume of 10,000 BESM-6 words. The volume of the text of subroutines in the archive o: the Dubna system was 13,000 words and was translated into 10,000 BESM-6 wor ls. References 4 (Russian).

USSR UDC 518.74

STRUCTURE OF GRAPHICS DISPLAY SOFTWARI

Novosibirsk AVTOMETRIYA in Russian No ', Sep/Oct 78 pp 85-86 manuscript received 21 Feb 78

DEBELOV, V. A. and MATSOKIN, A. M., No osibirsk

[Abstract] The structure of graphics display software developed in the Computer Center, Siberian Division, USSR Academy of Sciences, is described. Central to the entire system served by the software is a BESM-6 computer. Through a minicomputer one or several graphics displays is connected to the central computer. The software is made up of three parts: MONITOR--a software control block; PASSIVNYY DIALOG--subroutines for forming, storing and showing the information on graphics devices; and AKTIVNYY DIALOG--a block for servicing user directives. Part of the MONITOR software is BLOK OBMEN, for interchanging information between the BESM-6 and the terminal computer. In the PASSIVNYY DIALOG part of the software, points, vectors, segments of straight lines, symbols and so on make up the graphics information. The archives of graphical information segments is on a magnetic disk; it has the following facilities for working with the segments: 1) Bring in segment; 2) Supplement segment; 3) Combine two or more segments under a single name; 4) Structure a segment, that is, label its parts; 5) Remove from a segment some of its labeled parts; 6) Get information about the segment: length and constituent graphical primitives; 7) Execute an affine transformation of the segment; and 8) Remove the segment from the archive. Segments from the archive can be shown on a graphics display and on devices serviced by the SMOG graphics system. References 1 (Russian).

USSR UDC 681.3.04

FEASIBILITY OF BUILDING DEVICE-INDEPENDENT SYSTEMS FOR DISPLAY OF GRAPHICS INFORMATION

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 86-88 manuscript received 21 Feb 78

PANKEYEV, G. A., Novosibirsk

[Abstract] Two graphics information systems can serve to illustrate the problems of building device-independent systems for displaying graphics information: GRAFOR and SMOG. Picturing an inverted pyramid with either GRAFOR or SMOG as filling the pyramid and with MOVE or TRA routines as the tip, these routines have the function of drawing a line segment and advancing the light pen from the instantaneous point to an indicated point. Information formed at this stage is device-independent. When the graphics information display system has more than one write assembly, interconnections between the write assemblies multiply the scope of the device-independent information. In this case the type of line type on beam intensity can be modified; the discretization step can be changed. Adapting the system further, introducing some universal graphics file as the level II subroutine means that an array of information primitives is now available: choice of writing assembly, step, segmentalizing, circular or elliptical arcs, new symbols and so on. Since 1975 in the Novosibirsk Division of the Institute of Precision Mechanics and Computer Engineering, USSR Academy of Sciences, the GRAFOR-A complex of graphical subroutines has been operating, based on a BESM-6 computer. The complex was expanded with several routines: net-drawing, isoline-drawing, vector field-drawing, a mapping program and so on. Later, the YeS-7051 (plotting board type with own memory) and the YeS-7052 (roll type) plotters were connected to the complex. Figures 3; references 5 (Russian).

USSR UDC 681.3.06

GRAPHICS PACKAGE FOR A COMPLEX OF A BESM-6 COMPUTER AND AN ELEKTRONIKA-100I MINICOMPUTER WITH UGD-43 GRAPHICS DISPLAY

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 89-91 manuscript received 21 Feb 78

BOBKOV, V. A., GOLENKOV, YE. A. and PERCHUK, V. L., Vladivostok

[Abstract] Graphics software is described for a computer complex consisting of a BESM-6 and an Elektronika-100I minicomputer with a UGD-43 graphics display. Interfacing between the computers was achieved with an interfacer developed at the Joint Institute of Nuclear Research (Dubna). The graphics display has an alphanumeric keyboard and a light pen. The proposed graphics software package is based on the DISGRAF graphics package. The latter was developed for the BESM-6 with the DUBNA executive system. Higher-level routines (assigned to the BESM-6, the core computer in the configuration) construct images, transform images and perform image-blanking operations. The routine module for the display has the following functions: 1) Preparation and formation of the display file intended for transfer to the main memory of the Elektronika-100I minicomputer; 2) Identification of image segments; 3) Image modification; 4) Organizing the graphics dialog mode; and 5) Organizing the interfacing of the BESM-6 with the Elektronika-100I. Image modification offers these options: 1) Removal of the named image segment; 2) Replacement of the named segment with a new one; 3) Entering an inhibition on the indicated segment or permitting a glow on the display screen; and 4) Ordering the blink mode for an indicated image segment. References 1 (Russian).

E. Automated Design and Engineering

Translations of Articles

USSR

NEWS OF THE BELORUSSIAN INSTITUTE OF TECHNICAL CYBERNETICS

Minsk SOVETSKAYA BELORUSSIYA in Russian (Photo Caption) 9 Jan 79 p 2

[Text] The Institute of Technical Cybernetics is one of the leading institutes in the Academy of Sciences Belorussian SSR. Its staff is working on the creation of fundamentally new design technology, based on mathematical methods and computer technology resources and having great practical significance. At the present time, programs for designing metal-cutting tools are being studied under industrial conditions. Systems for automating the design of dies, the technological processes involved in machining parts, and others are being introduced successfully at the country's enterprises. The use of computers reduces the labor-intensity of design work by dozens of times.

In the photograph: Candidate of Technical Sciences V. T. Pridukho (right), senior scientific research worker of the institute, and V. P. Feshchenko, junior scientific research worker, are working on the design of a reduction gear.

Abstracts of Articles

USSR UDC 518.74

PRINCIPLES OF THE SIGAM GRAPHICS SYSTEM

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 18-25 manuscript received 21 Feb 78

DVORZHETS, V. I., Novosibirsk

[Abstract] Embodying most of the SMOG system—a graphics system, the multipurpose modular graphics system SIGAM was developed in the computer graphics laboratory of the Computer Center, Siberian Division, USSR Academy of Sciences. The SIGAM can find applications in problems of designing, scientific-research and other areas. The system is an ensemble of special equipment, a base monitor and a set of base equipment. A given equipment set is dedicated to executing a special or a base task and is made up of modules. Each module executes one or several base or special functions. At present, SIGAM is implemented with a BESM-6 computer of this computer center. System development and implementation proceeds by stages. Currently the first system stage is being implemented: it consists of a base monitor, six special and five base equipment sets and a set of auxiliary programs, including a system generator and test problems. Defined as a graphics object is an object constructed under the rules of the SIGAM system and stored in the operational or the external graphics archives. Generally, a graphics object is a structure that can be formed by combining or transecting standard graphics objects. Figures 3; references 7: 5 Russian, 2 Western.

USSR UDC 681.3.068

COMPUTER-AIDED FILM MAKING

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 28-33 manuscript received 21 Feb 78

STEPANOV, V. P., Novosibirsk

[Abstract] The MONTAZH system is intended for automating the making of a computer film during several stages: when coded graphical information is being collected--the starting material of the future film; when collected material is edited; and during photography of the computer film onto motion picture film. The system is implemented with a BESM-6 computer interfaced with a YeS-7064 graphics display, a YeS-7052 roll type graphic plotter, a YeS-7906 ATsVP and RFK-5 motion picture camera. Organizationally, the archive consists of data files; graphical images produced by a user's program and stored in coded form. Four types of data are in the archive: files, frames, scenes and series. A file is defined as a collection of features and data intended for processing in the YeS-7064 graphics display. In this process images are formed consisting of points, lines and alphanumeric symbols. A frame is a collection of one or more files. A scene is a sequence of frames as such or frames of earlier produced scenes, acting as subscenes. A series is a film library of magnetic films, that is, a sequence of scenes already produced. Hierarchical relationships among archive components in the system are shown by a listed form of data storage. Presented as an example is a scenario of a film simulating the discharge of industrial effluents into the atmosphere, totalling 5990 frames. Figures 2; tables 1; references 3 (Russian).

USSR UDC 681.3.068

USIDO--A METASYSTEM FOR DESIGNING INTERACTIVE GRAPHICS SYSTEMS

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 77 pp 33-37 manuscript received 21 Feb 78

FISHELEV, V. I., Novosibirsk

[Abstract] The USIDO is a universal metasystem for designing interactive graphics systems. It is a metasystem because with it system graphics and interactive blocks do not have to be programmed, but only blocks responsible for the computational part of the task. Design time is saved by simulating in advance systems built for the USIDO. What the user primarily works with in systems built with USIDO assistance are pictures. All editing

operations--erasing, addition, rotation, scaling and advancing--are done on pictures or parts of pictures. The graphical structure of data that allows for the features of two-dimensional objects is utilized. Tables of correspondences are fed into the display buffer for comparing pictures with sections of the display file. Because the computer memory allocated for data structure is small, programmed extension of this memory on drums is provided for in the system. For user activity, the display screen is divided into six areas. Area one is where pictures are constructed and modified. It is a "window" through which images are observed or constructed on a large sheet. Area two presents the graphical results of computation. In USIDO area three the user is given messages. Area four is where the set of lighted buttons are. Another control area is area six, imaging the numbers and functions of the function keys the user can reach at a given instant of time. Standard graphical elements the user uses in picture-building are in area five. Special-purpose subsystems are built with the USIDO. The subsystem library is made up of: 1) A set of routines that are part of the subsystem and not of the USIDO; 2) A list of sheets with standard graphical elements; 3) A list of subsystem states; and 4) Tables of standard graphical elements and tables of constraints for connections used in the given subsystem. As to archives, each user has two: a temporary archive for storing pictures that are to be reproduced later in other list locations for the user to work with. This archive is retained just for one work session. The permanent archive is where the user keeps information he may need in other work sessions. It stores lists with standard graphical elements that the user has drawn, temporary archives and lists with images that are designed by the user. The permanent archive is on magnetic tape. It provides for the protection of information in the user's name. Architecturally, seven blocks comprise the USIDO: initialization, monitor, data structure control block for the construction of standard graphical elements, drawing block, archive block, applications-programmer block and block for interfacing with the graphics devices. In summation, the USIDO uses a BESM-6 computer with the YeS-7064 graphics display and the YeS-7051 graphics plotter and an operating system created at the Institute of Applied Mathematics, USSR Academy of Sciences. The USIDO is described in the high-level system language for the BESM-6 (YaRMO). The system capacity is 52 K BESM-6 words. System response time is usually less than 10 s, except for some commands, because of the features of the operating system and the YaRMO. Figures 1; references 16: 5 Russian, 11 Western.

USSR UDC 681.327

IMPLEMENTING THE GRADIS INTERACTIVE GRAPHICS SYSTEM

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 41-47 manuscript received 21 Feb 78

AVERBUKH, V. L., KARAKINA, I. V., PODERGINA, N. V., PONOMAREVA, L. S., SAMOFALOV, V. V. and SOLOV'YEVA, L. A., Sverdlovsk

[Abstract] The GRADIS interactive graphics system was implemented for a complex that is made up of a BESM-6 computer and an M-6000 ASVT (automated system of computer techniques), a "Vidi sintra" graphics display and a "Benson-220" plotter. The M-6000 has a 16 K main memory. The M-6000 software includes a main control system (OUS), FORTRAN translators and a mnemonic code. The display has an alphanumeric and a function keyboard and a light pen; the display also has its own memory for image reshowing. The "Vidi sintra" display is a noninitiating unit; information from it is fed into the M-6000 by interrogation. In designing the GRADIS system, the goal was to build general-purpose base equipment for the problem-oriented programmer. The equipment organizes the storage of graphical information in the external memory, isolates image elements and fragments, assembles an image from elements, provides graphical interaction via the display with the task handled by the BESM-6 computer and documentalizes the pictures (frames) seen on the display. Subroutines in the GRADIS system are eight in number: 1) GRAFOR, building up image elements; 2) CHERTEZH group subroutines, forming drawing in a given file located in the main memory, on magnetic drums or tapes; 3) DISPLAY group subroutines, forming t. e display file; 4) GRAFIK group subroutines, forming the plotter file; 5) ARKHIV group subroutines, for working with drawing banks; 6) FRAGMENT group subroutines, for isolating drawing fragments and transforming them; 7) SVYAZ' group subroutines, for two-way interfacing of the BESM-6 computer with the display; and 8) Graphics station in the M-6000 computer, for working with the graphics display. GRADIS subroutines that are accessible to the user total six: 1) Determining the location of the graphics file; 2) Identifying the image elements; 3) Isolating the drawing fragments; 4) Forming a drawing with allowance for the type of graphics unit; 5) Organizing the work with the data bank; and 6) Organizing operator interaction with the task. References 5 (Russian).

USSR UDC 681.3:517.53:518:517.944:947

SOME PRINCIPLES IN DESIGNING INTERACTIVE GRAPHICS SYSTEMS WITH THE EXAMPLE OF IMPLEMENTING THE SETKA SYSTEM

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 50-54 manuscript received 21 Feb 78

YEROFEYEV, A. V., Novosibirsk

[Abstract] Interactive systems have these requirements to satisfy: simplicity, logicality of input language structure and system operating economy from the viewpoint of both user and program. Also needed in interactive systems are error control, explanatory comments and condensed commands for experienced users. The small-capacity, specialized-use SETKA interactive system is described in the present paper from the point of view of the requirements mentioned above. The system serves for constructing difference nets in the interactive mode in two-dimensional curved domains. As to requirements, first: system simplicity and logicality were achieved by the system's control language. User interaction with the system takes place using light buttons, sometimes a function keyboard, and much less often an alphanumeric keyboard. Each state of the SETKA system differs from other states by its completeness. Thus, only the outer shape of the domain is drawn in the first state; in the second, nets are calculated with an algorithm; in the third, the nets are edited, including the specifying of the internal nodes; in the fourth, a motion picture film is recorded. System operating economy from the user's viewpoint was not fully met, because four YeS-7064 display devices had to be worked with: light pen, joystick and function and alphanumeric keyboards. Program operating time can be economized by optimal dialog organization: one of the two modes finds the system waiting for the user to respond, and in the other mode, the system checks to see whether an act came from the user. If so, a command is issued for the necessary subroutine, or else continued operation associated with processing the user's last act goes on. As to dialog intensity, it can be defined as the system response time to the user's act: 1-2 s in this system. Dialog clarity is achieved more decidedly with the joystick than with the light pen: operating in two modes, the joystick can either operationally move the light spot or advance it in 0.25 mm linear increments. As for error control, because the system is small and simple, error control is very limited. Figures 1; references 4: 3 Russian, 1 Western.

USSR UDC 681.3.06:51:681.327

NUMERICAL SYNTHESIS OF TONAL IMAGE OF ILLUMINATED SURFACES AND RASTER VISUALIZATION

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 59-64 manuscript received 21 Feb 78

KUZHUTOV, A. V., LEUS, V. A. and POLESHCHUK, N. S., Novosibirsk

[Abstract] A method is proposed for the numerical synthesis of the tonal images of three-dimensional bodies, modeled with a computer. The discrete model of surfaces is used. The imaging system is of the raster type; it was developed and built in the Institute of Mathematics, Siberian Division, USSR Academy of Sciences. In the computer memory, a data file corresponds to the set of three-dimensional bodies specifically oriented in a Cartesian coordinate system. Hierarchical structure is adopted in the data file, to permit transferring the degree of freedom or connectedness of bodies during translations. Assigning surfaces with sets of discrete surface elements determines the content of the hidden-surface shadowing and removal algorithms. A file of discrete picture elements is allocated to each scan of a future image in the computer memory. The algorithmically derived matrix of brightness values is stored in the computer memory. Microfilm output devices are used for matrix transformation into films of a visible tonal image, storage of frames and then the operational representation of the resulting film. A television set is used to display the computer-synthesized film. Given a raster discreteness of 160 x 128 points with 32 different brightness levels, a memory of more than 10^5 bits is required. Figures 3; references 4: 2 Russian, 2 Western.

USSR UDC 621.398

USE OF MODULAR EQUIPMENT FOR REMOTE MANAGEMENT WITH BUILT-IN MICROCOMPUTERS IN THE CONSTRUCTION OF DISTRIBUTED AUTOMATIC MANAGEMENT SYSTEMS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 79 pp 3-6

PSHENICHNIKOV, A. M., dr in technical sciences

[Abstract] Fourth-generation modular equipment for remote control (ASTT-2) has built-in microcomputers. Communication with the latter is established by conventional methods of telemechanics, while interaction between them is facilitated by a common memory field, by a transfer module, or by a hookup to common busbars with a special prioritization. A distributed automated

management system (ASU) on this basis is much more versatile and reliable than one on the basis of first-generation equipment for remote management (ASTT-1). The accuracy is one class better, and furthermore, achieved with much less labor and at a fraction of the unit cost. Figures 5; references 6 (Russian).

USSR UDC [621.38.001.2:681.3].001.5

VERSATILITY OF AN AUTOMATED DESIGN SYSTEM: PROBLEMS AND SOLUTIONS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 1, Jan 79 pp 7-9

KUZ'MIN, B. A., engineer

[Abstract] The versatility of an automated design system (SAPR) is analyzed, with respect to input data and object models. The principal application of such a system is printed circuits, the design of which must take into consideration the geometrical constraints as well as the technological means of synthesis and the electrical properties of components. A model is constructed, after the optimum of all possible combination of parameters has been chosen with the aid of tables, this model including appropriate algorithms preferably self-contained for maximum program speed and including a standard interface. For illustration, the procedure and the versatility question are applied to the assembly of radio components. A static model on a uniform xy-grid is found to be adequate for basic routing of connections, but a nonuniform xy-grid appears more flexible and a dynamic model may be necessary for situations where routing problems unpredictable beforehand arise during the process. Versatility of a SAPR is closely dependent on the computer hardware and software. The "Monika" system already leans toward third-generation computers, most of its programs having been written in the FORTRAN language and only a few of them in the ASSEMBLER language. Figures 5; references 1 (Russian).

USSR UDC 621.002:681.3

DATA STRUCTURE IN AN INTERACTIVE GRAPHIC SYSTEM OF DESIGN AUTOMATION

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 1, Jan 79 pp 9-11

ZABARA, S. S., candidate in technical sciences

[Abstract] Data presentation is a major problem in software development for graphic interaction systems. A list structure, whether associative, hierarchical, or sequential requires a smaller memory capacity but more machine time. A positional structure, on the other hand, requires less machine time but a larger memory. Moreover, a positional data structure covers not only graphic elements but also all other elements within the free field of a design object on which graphic elements can be drawn. Here a system is described where conversion from one structure to the other occurs continually so as to ensure a minimum data volume for the display and a minimum machine time for the computer. Accordingly, a positional structure is used for describing the discrete field of a design object and storing it on a magnetic disc, while a sequential list structure is used for displaying the data through a buffer memory and storing them on a magnetic tape. The data array can either of the mosaic or the vector type. One principal data array contains a list of coupling components, very important for describing electrical networks in the design of printed circuits. Figures 1; references 3: 1 Russian, 2 Western.

USSR UDC 621.316.001.2:681.3

STRUCTURE OF MANAGEMENT OBJECTS AND DATA ORGANIZATION IN AN AUTOMATED DESIGN AND TESTING SYSTEMS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 79 pp 13-14

KOSHARSKIY, B. D., candidate in technical sciences, and IL'INA, N. A., engineer

[Abstract] An automated design and testing system (SAPR) is considered applicable to low-voltage equipment. The management objects of its two complementary subsystems, automated design and automated testing, are described by two ternary expressions reducible to two groups of binary expressions. This imparts to such a management object a 2-rank structure, with the basic elements of the object in the first rank and the relations between their properties or the properties of their relations in the second rank. Here a structure of management objects with attendant maintaining processes and an organization of the data bank are developed on this premise. The latter belongs to both subsystems in common so as to ensure its multiaspectual use

to the advantage of each, and it is accessible to users in the FORTRAN language. The data base includes a hardware file with nameplate information and a technical file covering the characteristics of low-voltage equipment. The technical file branches into one for automated management and one for automated testing, each with the appropriate contents. A major problem in organizing the data bank is ensuring a comprehensive description of data and all pertinent information. This is done in tabular form, the most important function of data description tables being to ensure correspondence between the data bank and the user. Such a structure and organization not only increases the response speed and the reliability of the data bank but also reduces the necessary capacity of the computer memory typically by 30 percent. Figures 2; tables 1; references 4: 3 Russian, 1 Western.

USSR UDC Δ 331.875.4:658.512

AUTOMATED DESIGN OF AUTOMATIC ENTERPRISES MANAGEMENT SYSTEMS

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 5, May 79 pp 33-35

IVANOV, A. P., candidate in technical sciences

[Abstract] Automated design of automatic enterprise management systems (ASUP) is another logical forward step in design standardization at any level, for the purpose of coordinating all socialist industrial production in terms of basic economic indicators. It involves the use of unified systems of engineering, manufacturing and administrative documentation. The availability of Unified System computers has greatly contributed to progress in this direction. Further necessary are unification of essential subsystems, complete software, and organization of all corresponding activities. The first variant of such an automated design was made at NIIUMS (Scientific-Research Institute of Control Computers and Systems) in Perm, combining a rather simple mathematical apparatus with automatic programming in problem-oriented algorithmic languages and based on a parametric dependence of the control on the object. One drawback of such an automation is the inherent rigidity with respect to changes including improvements. More flexibility, allowing for modernization whenever the performance of an object becomes unstable or a method of control becomes inadequate, is sought in a research project now underway on automating the development of data control systems. Here the administrative personnel becomes the collective architect of an ASUP, an open end is made available for including new problems and solutions, and procedures for development and adaptation are also automated. This automation of data-control-system development will operate by the "interrogation" method devised by the "Lenelektromash" Scientific-Industrial Association, with either second-generation Minsk-32 or third-generation YeS-1040,

1050 computers. In the latter version it will provide for implementation of economic-mathematical procedures, organization and utilization of data banks, problem solution by network planning and control method, organization of data search systems, and execution of specific steps in data processing.

II. ECONOMIC APPLICATIONS

A. Bloc-NonBloc Cooperation

Translations of Articles

FOREIGN CONTACTS BY INSTITUTES OF LATVIAN SSR ACADEMY OF SCIENCES

Riga SOVETSKAYA LATVIYA in Russian 4 Feb 79 p 2

[Article by S. Vladimirova: "The Geography of Scientific Contacts"]

[Text] Extensive foreign contacts largely determine the activity of the Institute of Electronics and Computer Technology of the Latvian SSR Academy of Sciences. Recently Candidate in Technical Sciences A. Petrenko and scientific worker Yu. Podvysotskiy departed for Austria. There they will spend several weeks at the International Institute of Systems Analysis.

The purpose of this mission is to organize one of the international communications channels between Riga and Vienna for transmission of scientific information by means of computers. This is only part of the extensive work in developing collective-use computer networks in which the Latvian institute will participate along with many scientific institutions of the same profile of the Soviet Union.

In the near future several other workers of the institute will travel to CEMA countries--Hungary, Czechoslovakia and Bulgaria, with which long cooperation has been established on theoretical and applied problems of engineering cybernetics.

6521
CSO: 1863

B. Over-all Planning Methods

Translations of Articles

FIVE-YEAR PLANNING DISCUSSED

Kiev PRAVDA UKRAINY in Russian 7 Apr 79 p 2

[Article by N. Lebedinskiy, deputy chairman of Gosplan of the USSR]

[Text] The editorial board is continuing to publish materials devoted to the 50th Anniversary of adopting the first Five-Year Plan for development of the national economy of the USSR. Today we are answering the letters of readers, specifically, of G. Yermashev from Khar'kov and of L. Safranov from Artemovsk, Voroshilovgradskaya Oblast, who request us to talk about the significance and forms of socialist planning. The use of the first unit of the automated system for planning calculations--ASPR, which recently became operational in Gosplan of the USSR, and about why we selected a 5-year planning period are discussed in materials prepared by Novesti Press Agency.

Machines Calculate

The automated system for planning calculations (ASPR) already serves as a powerful means of improving planning for tens of thousands of industrial enterprises, associations, mines, open-pit mines, electric power plants, for the world's largest transport system, health system, internal and foreign trade, everyday servicing of the population, for many scientific and educational institutes and other institutions of the country.

More than 3,000 problems related to development of long-term, 5-year and current plans are now solved by using computers in the USSR Gosplan and the Gosplans of the union republics.

The use of ASPR permits more complex linking of problems of sector and territorial planning at the state level, a better combination of main national economic problems of the country with development of sectors in the union republics and large economic regions and permits concer ration with greater efficiency of resources for solving intersector problems and for fulfilling especially complex problems such as improving the fuel-energy base and developing machine building and agrarian-industrial complexes.

Computers permit a sharp reduction of labor expenditures in compilation of plans and frees the ministry of compilation and sending cumbersome applications for materials to the USSR Gosplan. Let me site an example: whereas tens of man-months of labor were previously required by a large group of qualified workers in compiling the import structure of the USSR, a computer now performs this operation in only 20 minutes. Moreover, the machine variant has much greater dependability. More than half of all planning documentation is now completed directly on the computer.

Development of the new system will help to determine more suitable locations in the country for construction of enterprises of one or another sectors and in some cases will help to determine the feasibility of construction itself. Thus, computer calculation of the prospects for development of a ship repair base of the country made it possible to conclude that the same ship repair capacities can be provided without construction of a new yard costing 100 million rubles, whereas this construction would undoubtedly be provided by ordinary calculations.

On the whole, computer technology and economic-mathematical methods introduced in Gosplans of the union republics only during the first stage will yield a saving calculated in hundreds of millions of rubles.

In developing the technical base of ASPR, we have been oriented toward the latest rather than the older types of computers--toward those that are now being developed in the USSR and other CEMA member countries in the form of the third-generation Unified Electronic Computer System. These machines will naturally operate and are already operating in a unified language for all computers by a unified method, providing complete interaction.

Investigations are now being conducted to develop the second unit, which is planned for introduction in 1985. The problem is to establish more extensive interaction between the ASPR of the USSR Gosplan and automated management systems (ASU) of ministries and agencies.

I would like to emphasize that development of ASU in such a large country as ours, with its dispersed centralized-planned economy is a matter of exceptional complexity, which has no analogs in international practice. Investigations to develop ASU at all levels are continuing on a wide front. Their scales will subsequently be developed steadily. The expenditures for realization of these investigations are already being recovered by the economic effect which the state receives from introduction of ASPR and ASU. In the near future the advantages will be even more significant and this will permit fulfilling the problems posed by the 25th CPSU Congress and the last Plenary Sessions of the CPSU Central Committee with even greater success.

6521
CSO: 1863

Abstracts of Articles

USSR

A UNIONWIDE PRODUCT CLASSIFIER: DEVELOPMENT AND INTRODUCTION

Moscow KOMMERCHESKIY VESTNIK in Russian No 8, Apr 79 pp 18-19

BATUREVICH, O., candidate in economic sciences, section head at VNIIETSistem (All-Union Scientific-Research Institute for the Economics of Trade and Management Systems) and LIDOVA, N., senior scientific research worker

[Abstract] Computerization of the marketing process requires a codification of products. Here a unionwide classifier of industrial and agricultural products is described which has been developed and introduced at the All-Union Scientific Research Institute of Economic and Technological Systems. It is based on a hierarchical decimal coding system with six digits for class-to-variety breakdown and four digits for breakdown within each variety. The first two digits of the six identify the class, with only 46 classes of 99 available covering all consumer goods. The system meets the requirements of all interested agencies, namely the USSR State Planning Commission, the USSR Central Bureau of Statistics, the USSR State Committee for Material and Technical Supply, the Central Union of USSR Consumer Associations and the USSR Ministry of Trade. A great deal of effort has been put into the classification of all product according to a universally acceptable nomenclature and in conformance with appropriate retail price lists. Some deficiencies are still there to be eliminated such as omission of certain products, whether imported or local ones, duplication of the same product under two or more codes, assignment of class code numbers not in the hierarchical order, and occasional conflicts between agencies as, for example, in the case of light-industry products. Eventually this classifier will become part of a unified automated management system.

C. Economic Control at Local Level

Abstracts of Articles

USSR UDC 681.3.658.3-05

METHOD FOR CALCULATING THE NUMBER OF PERSONNEL NEEDED FOR THE PLANNING AND INTRODUCTION OF AUTOMATED PLANNING MANAGEMENT SYSTEMS IN COMPUTATION CENTERS

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 4, Oct/Dec 78 pp 45-50 manuscript received 9 Jan 78

SKOPEN', N. M., engineer

[Abstract] An important factor in the planning of the organization structure of computation centers working under an automatic planning management system (ASUP) conditions is the calculation of the labor resources needed to plan and implement the assigned problems. These calculations are based on the following factors: 1) Volume of work to be done; 2) Work quota per conventional employee (average level of qualification); 3) Salaries; and 4) Allowable time for the fulfillment of a given function. The second of these is the most important, and is a function of the degree of complexity of the complex of assignments and the programming languages, the level of worker qualification, and the extent of the use of standard planning solutions and the library of standard programs. Using methods developed both by TsNIITU (Probably Central Scientific-Research And Planning-Technological Institute For Organization And Techniques of Management) and himself, the author reduces the choice of the number of personnel needed on each level, within the framework of a given setup, to that which reduces to a minimum the labor costs for the realization of the entire complex of functions. Figures 3; tables 2; references 4.

USSR

COMPUTERS IN THE SERVICE OF SECTOR PLANNERS

Moscow EKONOMIKA STROITEL'STVA in Russian No 4, Apr 79 pp 41-43

ZABELIN, A. N., deputy minister, USSR Ministry of Light Industry

[Abstract] Development of an automated planning system is a long-range goal of the USSR Ministry of Light Industry. The project includes development of an organization as well as of hardware and software for this purpose. A central item here is consolidation of third-generation computers with modern peripheral equipment such as, for example, graph plotters introduced in 1978. Its successful completion, however, will hinge on the availability of adequate programs. Software already in existence includes specifications, structural-engineering and hydraulic-engineering design, budget design, shipping activities and schedules. Now being developed are electrical-engineering and heat-and-ventilation design. Work is also being done on documentation so that soon 56 percent of all textual and numerical documents and 30 percent of all graphic documents will be put out automatically. The most difficult task is to ensure the organizational backup. This requires both planning and control of all project components involved, which is taking place at the ministerial level.

D. Extractive Industries, Fishing

Abstracts of Articles

USSR UDC 658.012.011.56

ON THE QUESTION OF DETERMINING THE RATIONAL COMPOSITION OF PROBLEMS SOLVABLE IN AN INTERCONNECTED SHARED-USE COMPUTATION CENTER

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 4, Oct/Dec 78 pp 39-42 manuscript received after completion 28 Mar 78

YAKUNIN, A. A., candidate in technical sciences, and KHOKHLOV, V. A., engineer

[Abstract] The conversion to interconnected shared-use computation centers in the Sector Automated Management System For Ferrous Metallurgy of the UkrSSR (OASU-Ukrchermet) was based on a number of reasons, some of which are common to many other sectors and some of which (the high concentration of plants needing a broad spectrum of services, in particular) are peculiar to that specific sector. All of the problems that could be considered for subordination to the OASU were divided into two groups--those pertaining to enterprises and those pertaining to production associations. These problems were then subjected to a three-stage decision process before being considered for automation: 1) The selection (by economic criteria) of subsystems that should be automated; 2) Determination of the set of primary problems (and their information interrelationships) in each subsystem; 3) Determination of the stage of entry into the interconnected computation center, allowing for the limitations on the technical facilities and the stage of the latter's development. Using three of the largest production associations as an example in their calculations, the authors conclude that immediate operational management is not feasible, but that the solution of automated planning management system problems in interconnected shared-use computing centers (KVTsKP) is feasible because of the greater periodicity in information collection. The results of their work were used as the basis of a program for the creation of integrated automatic control systems for the Ukrainian SSR's ferrous metallurgy industry for 1976-1980, which program was approved by the USSR Council of Ministers' State Committee for Science and Technology. Figures 1; references 4.

E. Manufacturing and Processing Industries

Translations of Articles

USSR

COMPUTERS AND CONTROL MACHINES PLANT OF 'ELEKTRONMASH' ASSOCIATION

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov/Dec 78 photo on inside back cover, caption on p 143

[Text] The photographs shows wired connections being made by the twist-on method using an MPA-1 semiautomatic wiring device at the Plant of Computers and Control Machines of the "Elektronmash" Industrial Association in Kiev. More detailed information on the first stage of the "Nakrutka" [Twist-On] Automated Process Management Systems will be published in the following issue of the journal.

USSR

AUTOMATIC POLARIMETER MANUFACTURED BY 'ELEKTRONMASH' ASSOCIATION

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov/Dec 78, photo on inside front cover, caption on p 143

[Text] The photograph shows an automatic electronic polarimeter [PEA; polyarimetr elektronnyy avtomaticheskiy] used for determining the sugar content of sugar beets when the sugar factories receive them from the suppliers. The use of this device ensures highly accurate measurements and speeds up the measurement process several times. It thus sharply reduces the idle time of motor vehicles during unloading and makes it possible correctly to distribute bonuses to encourage farms in order to increase the sugar contents of their beets. The PEA is being manufactured in series by the "Elektronmash" Industrial Association in Kiev. In 1975 it won a diploma at the Exhibition of Achievements of the National Economy.

USSR

AUTOMATED SYSTEM OPERATING AT PIKALEVO COMBINE

Moscow PRAVDA in Russian 14 Mar 79 p 2

[Article by V. Senin, PRAVDA correspondent, Pikalevo, Leningrad Oblast: "Main Process Stage"]

[Text] Pikalevo is a small town, in the interior; you will not find it on every map. However, recently specialists have been constant visitors here. They are interested in the automated system for management of technological processes at the combine --the head enterprise of the "Glinozem" Association. The economic benefit from introduction of the "Nefelin" automated management system (ASU) has exceed 2 million rubles, and over 200 people were released in the sections. Operating in a continuous round-the-clock regime, the managing system insures accident-free operation of the equipment, and guards against lack of organization and rush work.

The combine in Pikalevo is one of the largest chemical-metallurgical enterprises in the country for complex processing of nephelines. The raw material is used in full measure: besides aluminum oxide, they produce soda and potash. Sludge is left, but even it is put to use: in the make-up of the combine is a cement plant, and a production facility for slate and asbestos-cement pipes. In the third-year of the five-year plan the balance-sheet profit exceeded 37 million rubles.

"The program of extensive application of means of computer engineering in the management of the technological processes has fully justified itself," explains the director of the "Glinozem" Association, Kh. Badal'yants. "Namely thanks to the automated management system we have been able sharply to increase the effectiveness and quality of the work of all units of the combine, and the growth in output produced has increased more than two-fold."

Production of aluminum oxide from nepheline ore is a chain of complex, continuously operating conversions. In addition, the processes are connected with one another by direct or return flows of intermediate products. Any changes in the regime at one process stage immediately affect the results. It is difficult for a person to follow it all, to make an analysis of the suspensions and solutions, to put in additives rapidly, to balance and feed them to the apparatus, furnaces, centrifuges, and filters. This is why the scientists and specialists decided to use electronic equipment in the management of technological processes.

"The work at hand was complex," says the director, "there were no standard ASU for enterprises of our sector. Also required was a psychological reorganization: it was not only the workers used to doing everything 'by eye' and who had become highly skilled in this who did not believe that the devices would perform the assignment for them, but even certain leaders of production regarded this as excessive regulation of their functions. I feel that this was just one more process stage. And, perhaps, the main one."

The Pikalevo workers could not adapt some system close to their combine for management of technological processes: in the different departments the ASU are set up in their own way, using the method of individual planning. Each of such systems, as a rule, solves strictly its own problems. The Pikalevo workers went to the Lenelektronmash Association, which is charged with the duty of creating ASU for different production facilities, but they did not get understanding and support. It was necessary to act independently--they concluded an agreement about creative cooperation with the head All-Union Scientific-Research and Planning Institute of the Aluminum, Magnesium and Electrode Industry (VAMI) and the State Planning Institute "Proyektavtomatika." The USSR Ministry of Nonferrous Metallurgy allocated funds and determined the Nefelin ASU to be the pilot one in the subsector. The responsible chief of operations was Kh. Badal'yants, and the chief designer of the system was senior scientific research worker of the automation laboratory of VAMI, Candidate in Technical Sciences M. Levin.

The research services of the technologists and specialists in automation were gathered by the directors into one experimental shop. Developed in it with the rights of departments were services for operation and repair of instruments and means of automation, and services for operation of electronic computer and software for the control problems. From the first days the engineers in the experimental shop, the technologists in the sections for alumina production, and also the researchers and developers from VAMI were joined in creative brigades. At the same time the "Proyektavtomatika" Institute formed an operations group.

"The stages of implementation of the plan are well known," states the chief of the experimental shop, Ye. Isakov. "The researchers do their part, and they transmit the results for testing. If the data are confirmed, the planners begin their work. The approach to the rules is this: there is a paper on the subject of each defect. This is where time was lost. Also here the work in all the units was conducted in parallel. Four main technological process stages were singled out, the basic mission was formulated for them and the indicators of the quality of the semimanufactures were established. The mathematical model of the process to be controlled was refined in the course of assembly of the automated control system and testing of the equipment. Operating personnel also participated in the adjustment and tests. By joint actions it was possible significantly to reduce not only the times, but also the cost of the operations."

The Nefelin ASU manages the majority of technological processes of alumina and cement production. The sections were changed beyond recognition: where previously it was dusty and dirty, now there is cleanliness. The streams of fountains are pulsating, and fish are thriving in the aquarium. The grinders rotate at a measured pace, the furnaces breathe with heat, the conveyors move with raw material and semifinished goods. But the workers are not in evidence. An instrument control man is on duty at the control panel. The instruments show how the process is going in the autoclaves or the furnaces, what the expenditure of the charge is in the basins, and whether there is an imbalance in the flows.

Management of the whole technology of production is concentrated at the central dispatcher point. The dispatcher performs the duties of the shift chief technologist. Subordinate to him are the operators for the process stages. The workers and foremen have only to see to it that the equipment operates properly. The on-duty operator of the management post sees how the reaction is taking place, and whether the components are sufficient.

The quality of the output depends greatly on the completeness of the information, which comes from the sites, and the analysis of samples. Dozens of pick-ups sensitively catch the smallest deviation and transmit the information to the electronic computers. At the same time data comes from the chemical laboratory. The necessary sample is supplied there from the process stages by a pneumatic shuttle. Forty seconds, and the quantum meter issues exhaustive data.

The ASU of the technological conversion stages not only follows the work of the batteries, furnaces and autoclaves, but it also distributes the load among them, and coordinates productivity in the case of stoppage of one for repairs or preventive maintenance. The electronic computer establishes where the trouble has occurred and for what reason. Each disruption is recorded and at the end of the month the bonuses are added up for the technologists and foremen. If there were no omissions, the bonus is received in full. But if one had not watched, and hoped for the best--the bonus is less. The electronic computer is impartial.

"Now we simply cannot imagine working without computers," says the chief of the aluminum oxide shop, V. Afanas'yev. "There is a high sophistication of production, productivity, and quality of the output. When we prepared the charge by hand, 10-12 percent of the raw material with the assigned properties was considered as the limit possible. Today the charge is made up 8-10-fold more accurately. The expenditures have been reduced by 1.5 million rubles."

The special feature of the method of the Pikalevo workers is that they have included their ASU in the administration, and figuratively speaking, they have gotten used to a unified technological chain of production, and they do not use it in the regime of an "adviser." The novelty of the system has been defended by 20 author's certificates. More than half of them is being patented abroad.

All the subsystems operate around-the-clock. Their use factor today comes to 95-98 percent.

Things have become easier for the managers. A worker does not go to the chief of the shop if there is a hitch. He phones the dispatcher's office. The chief of the shop is engaged in his own work: with the future, with the introduction of what is new, with the development of competition.

The improvement of management using the ASU in the Glinozem Association is continuing: auxiliary and labor-intensive processes are being automated at those production facilities where there are no continuous technological flow lines. Being developed and tested are versions of a subsystem for accounting and planning of fixed capital and the storage of materials. Here, of course, they have their own difficulties, but it is possible firmly to say: the Nefelin ASU has proved itself. Its results have been used during the creation of controlling systems at the Pavlodar Aluminum Plant and the Achinsk Aluminum Oxide Combine.

The electronic computer faithfully serves man, it helps him to improve production for the good not only of technical progress, but also of socioeconomic progress.

10908
CSO: 1863

INTERACTING WITH THE COMPUTER

Tallin SOVETSKAYA ESTONIYA in Russian 20 Mar 79 p 3

[Article by L. Andreyeva: "Dialogue with the Computer"]

[Text] The use of computer technology is finding wider and wider use each year in our country.

The Estonian SSR now has 65 computer centers and other organizations with computers. One of the largest among them is the computer center of the Ministry of Light Industry which until now has had a "Minsk-32." It recently put a Unified System 1022 computer into operation.

"This third generation computer," explained Arvo Mägi, director of the computer center of Estonian SSR Minlegprom, "is the last word in domestic computer technology. The US-1022 electronic computer differs from other single-purpose machines in that it has a larger memory which can handle multiple programs. Its capacity is at least four times as great as the "Minsk-32" computer.

"The machine includes five RI-7701 I/O terminals which, in the near future, will make it possible for ministry managers to conduct a direct dialogue with the computer: to give a question and get the necessary data on their own office CRT. The primary data to be displayed will relate to the daily accounting of production, shipment, and realization of production.

"Over the next 2 years we plan to incorporate problem sets for the enterprise: accounting of warehoused materials, performance of nomenclature plan, composition of cost calculations, optimum plans for sewing enterprises.

"The republic already has several of these machines and we are glad that we now have the Unified System 1022 computer...

"You can see we are now undergoing repair. The administration of the computer center is going to move to a new location and only the equipment will remain here. This will enable us to improve the degree of equipment of our center, whose primary task is to develop an automated management system (ASU) for the sector. In this Five-Year Plan it should save 800 000 rubles."

8617
CSO: 1863

Abstracts of Articles

USSR UDC 658.012.011.56:622.78

AUTOMATED PRODUCTION PROCESS MANAGEMENT SYSTEM FOR AN AGGLOMERATE FACTORY

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 4, Oct/Dec 78 pp 18-24 manuscript received 13 Apr 78

PLESKACH, V. I., GROMOV, N. D., SHEVCHENKO, L. U., and KOSHLAKOV, A. V., engineers

[Abstract] The automated production process management system (ASUTP) at the Azovstal' plant was installed in two stages: first, six automatic systems for the local management of separate production processes in the charging and sintering departments were set up, over a period of 5 years; second, the ASUTP was organized on the basis of these local systems, and it allowed them to retain their autonomy while operating in the output parameter stabilization mode. The ASUTP was based on a second-generation UM1-NKh-M minicomputer (which may later be replaced by a third-generation SM-1 minicomputer), and its operation is based on the division of all operational factors into two parts--constant and variable--that are used for comparison and management of all production process parameters during actual operations. The use of the system has resulted in reduced fuel consumption and increased output of higher quality agglomerate. Figures 2.

USSR UDC 681.3:66.012

AUTOMATED PRODUCTION PROCESS MANAGEMENT SYSTEMS FOR CONDUCTING TESTS IN PUMP-BUILDING ENTERPRISES

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 4, Oct/Dec 78 pp 42-45 manuscript received 30 Dec 77

BELYAYEV, V. G., engineer, and VEYTSMAN, P. G., candidate in technical sciences

[Abstract] The testing of pump parameters (total power, liquid transmission rate, amount of liquid pumped per unit of time, shaft power, shaft rotation speed, efficiency) is a process that lends itself to automation quite readily because of the small number of variables that must be measured. Because some of these measurements must be made indirectly, automation is desirable in order to eliminate human error and subjectivity. One automated testing system that has been developed utilizes an analog computer to process the results. The use of a computer makes it possible to have both permanent programs that are run regardless of the type of pump involved and special ones for different types. Calculations have shown that the savings achieved by the use of such a system is 3,000-4,000 rubles per 1 million rubles of production output, with its cost being recovered in 0.3-0.4 years. Figures 1; references 4: 3 Russian, 1 Western.

USSR UDC 658.512.002:621.774

A NOISEPROOF ALGORITHM OF TRACKING A PRODUCT SAMPLE WITH AN AUTOMATED MANAGEMENT SYSTEM IN A TUBE ROLLING MILL

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 2, Feb 79 pp 10-11

TARAYEV, A. L., RURUA, A. A., and OGANESYAN, A. SH., engineers

[Abstract] Tracking of product samples with an automated management system in a tube rolling mill (ASU TA) is often erroneous, either because of failures in the counting system, which includes photoelectric probes, or because of interference caused by rolling irregularities. A subsystem which almost completely eliminates this difficulty has been developed at the VNIIavtonatprom (All-Union Scientific-Research and Planning Institute for Automation of Production Processes) in Rustavi (Georgian SSR). It is based on an M-6000 control computer with separate counters for each reference point along the production line. The special algorithm of numbering the rolled product samples involves picking up signals from a point with probes, testing them in modules for input of initiative signals, and classifying them as useful or

noisy ones depending on whether the content of the appropriate counter in the computer memory is respectively larger than or equal to the content of the preceding counter. This subsystem has already been installed and operates in the ASU TA for one of the rolling mills in the plant. Figures 1; references 2 (Russian).

UDC

AUTOMATED PRODUCTION MANAGEMENT SYSTEM AND WORK TIME

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 3, 1979 pp 18-19

TRATSEVSKIY, I., candidate in economic sciences, and FUKSMAN, I., chief, Forging Shop (Kuznitsa), "Gomsel'mash" Plant

[Abstract] The automated production management system (ASUP) described in this work was developed at the Gomel State University, as applicable to the forging shop of the Gomsel'mash (Gomel Plant For Agricultural Machines). The entire shop is divided into many work stations where control boards (one per station) are installed. These boards are equipped with interlocking connections with all supporting services and with the dispatcher control board. The aim of this system is to organize an automated recording of the equipment idling time and to find a worker responsible for this idling. Using the control boards, it is possible to call any worker responsible for the equipment idling and to establish the cause. Each control board has a work station code number. This number appears on the support service display board and on the shop display board. The automatic recorder ARP-1M collects the information, fixes the total idling time for each machine and indicates the reason for the machine idling and the worker, or supporting service, responsible for the idling. If the machine idling cause is not eliminated within 3 minutes, the idling time is accumulated on account of a particular support service. When a machine idles without any solid cause, the responsibility is put on the worker operating it. The performance of each machine in the forging shop is fed into the plant computing center which issues daily tabulated sheet indicating the idling time of each machine and the cause. Expenses for the equipment idling time are deducted from bonuses paid to workers. Since the introduction of the ASUP in 1976, the shop productivity gradually increased and it amounted to 17% in 1978.

USSR

KIROVAKAN INSTITUTE DEVELOPING AUTOMATED PRODUCTION MANAGEMENT SYSTEMS

Yerevan KOMMUNIST in Russian ("Routes of the ASUP") 15 Apr 79 p 4

KOSTANYAN, N., non-staff correspondent of KOMMUNIST

[Abstract] The Laboratory of Automated Production Management Systems [ASUP] for Metal-Roasting of the Kirovakan Scientific Research Institute "Avtomatika" is developing a system for the Usol'ye Industrial Association "Khimprom" ["Chemical Industiy"]. According to E. Simonyan, head of the laboratory, the goal of the project is completely to automate the technological cycle of carbide production, from loading of raw materials to packing of the finished product. Monitoring and control of the individual parameters of the technological processes involved will be carried out from a central management panel, which will free many workers from physical labor and significantly improve the technical and economic indices of each workshop and of the plant as a whole.

The ASUP for the Usol'ye Industrial Association is being developed by leading engineers M. Gevorkyan, V. Gasparyan, and A. Kirakosyan. Two young specialists who recently graduated from Yerevan Polytechnical Institute, V. Khachatryan and A. Arutyunyan, are working side-by-side with the experienced researchers.

USSR

ELECTRONIC CONTROL OF A MILL

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Apr 79 p 2

POPEL'NUKH, V., candidate in technical sciences, Department head at the Kiev Institute of Automation; and TOMOFEYEV, B., academician, Academy of Sciences of the Ukrainian SSR, Director of the Kiev Institute of Automation

[Abstract] It would be impossible without automation to perform many machining operations at all, certainly not with the necessary precision and speed, efficiently and economically. An automated management system for technological processes (ASUTP) is, therefore, being introduced in the ferrous metals industry by a joint effort of five USSR Ministries (Ferrous Metallurgy; Heavy, Power and Transport Machine Building; Instrument-Making, Automation Equipment and Control Systems; Electrical Equipment Industry; and Special Constructions), after extensive planning since the beginning of this decade. Third-generation

digital computer control has already been installed in the open-hearth furnace at the Krivorog Metallurgical Plant, in the Acid-Bessemer furnaces at the Zapadno-Sibirskiy (West Siberian) and the Novolipetsk Metallurgical Plants, in the blooming mill "1500" and in the largest European general-purpose rolling mill at Nizhnyy Tagil', and in the wide-strip hot-rolling mill at Chernovitsy. Further progress in this direction is hampered to a considerable extent by inadequate coordination of goals and plans between the Ministries involved in the project. Furthermore, the setting up of a joint organization has not occurred soon enough and is not given top priority. Thus the installation of computers and electronic accessory equipment is still behind schedule practically everywhere, with a resulting appreciable loss of time and money. Personnel is not properly involved in the process, it should have been from the earliest stages of the project. To remedy the situation and to comply with the resolution passed by the Central Committee of the CP USSR at the 25th Party Congress with regard to development of the ferrous metals industry would require the friendly cooperation of metallurgists and engineers, machine and instrument designers, and construction personnel.

F. Transportation System

Translations of Articles

USE OF COMPUTERS AND MATHEMATICAL METHODS IN OPERATION OF RAILROADS

Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 6, 1978 pp 83-93

[Article o computers in railroad management]

[Text] At the Moscow Institute of Engineers of Railroad Transport (MIIT) was held the 15th All-Network Scientific and Technical Conference on the Use of Mathematical Methods and Computers in Railroad Operations. Participants of the conference were scientists of transport scientific-research and training institutes, workers of planning and design organizations and enterprises of mainline and industrial railroad transport; they considered questions of automation of planning and management of the shipment process, simulation and automation of station processes, and organization of movement on mainline and industrial transports. They adopted recommendations for further deepening and enhancement of efficiency of scientific research in improving the operational work of railroad transport.

In a section of the conference "Automation of planning and management of the shipment process in cargo and passenger movement," important problems of improved control of train movement, enhanced shipment capacity of railroad lines, improved management and regulation of locomotive pools, prediction of train wagon flows and organization of passenger shipments were discussed. The principles of unity and continuity of development and incorporation of automated railroad transport management systems were examined (ASUZhT).

In particular, much interest was offered by the results of a study done by the All-Union Scientific-Research Institute of Railroad Transport (TsNII MPS) on improving dispatcher direction of train movement on the basis of stabilization of dimensions of cargo movement. It is proposed that for calculation of irregular shipments the entry of cargo trains be made in separate categories on the movement graph. Calculations show that this will permit stabilization of cargo movement under on-line conditions and raise the implementable section speed by 8-12 percent, and reduce down time of ready rolling stock in outbound parks by over 20 percent.

Stabilization of cargo movement will alter the organizational principles of on-line planning and dispatcher regulation of train work: it will be possible to concentrate all dispatcher activities on control of the railroad and centralize management of on-line work in larger network areas, and automate control of the shipment process.

It was noted at the conference that the wide use of modern methods of computerized calculation makes it possible to greatly enhance the efficiency of control of train locomotives, improve calculation of their condition and dislocation in return sections. Thus at TsNII MPS an automated calculation system of the state and dislocation of locomotives was developed which provides for calculation of the daily plan for ongoing repairs and technical maintenance of TO-3, monitoring, and the order of organization of locomotive approach into the depot and periodic issuance of recommendations for servicing and equipment operations; prediction of anticipated load of technical inspection points, keeping track of the locomotives, analysis of their utilization and conditions of labor and crew rest. Methods were developed for regulating locomotive parks, whose use, as experimental verification showed, makes possible a reduction in train departure time from stations by 20-30 percent.

In addition, at TsNII MPS a model of locomotive condition was developed which ensures dispatcher personnel of the division and railroad administrations with data needed for optimum regulation of the locomotive park; at Novosibirsk (NIIZhT) and Dnepropetrovsk (DIIT) institutes of railroad transport engineers methods have been developed for distribution of the reserve of train locomotives among exchange and rehooking stations, computerized planning of the operational work of locomotive crews.

Furthermore, in the section the results were examined of a study completed by the Irkutsk Institute of Railroad Transport Engineers (IrIIT) on selection of the optimum capacity of the devices of two-way lines. Based on an analysis of exploitation work of large areas, recommendations were developed which provide for separation at technical stations of combined parks for passage of cargo trains in both directions, or the development of pre-junction intermediate stations in order to remove problems with passage of increasing train flows. It was also shown that enlargment of the park of train locomotives in elongated sections of locomotives crew work will not only permit a reduction in train delays, but will also reduce the need for road development of technical stations.

Participants of the conference heard and discussed reports on the development of prediction of entry of unladen wagons into the cargo road, informational model of the condition of the shipment process at GVTs MPS, improvement of maintenance of transient passengers in the switching junction based on unified system computers, and the use of doubled suburban/urban trains, etc.

At another section of the conference they discussed questions of improvement of the technology of sorting and section stations based on simulation and automation of station processes. The principles of improvement of the planning and management system of the shipment process in order to enhance handling capacity of sorting stations, which were developed at the Belorussian Institute of Railroad Transport Engineers (BelIIZhT) are of interest. They provide for a comprehensive approach to elaboration of plans for marketing produce by enterprises and work of interacting kinds of transport, introduction of intraday hourly planning of cargo allowing for a guaranteed rhythmic operation of sorting stations, observation of shipment and technological condition plans on the entire path of cargo tracking, etc.

At the Leningrad Institute (LIIZhT), research is being done on enhancing reliability of plans of train formation of sorting stations using an information and planning system (IPS). It was noted at the conference that for this purpose it is advisable to ensure continuous access and input of data into IPS, reduce depth of information, widely use full-scale telegram tapes for calculations, organize periodic correction of variance graphs of dispatch, and set up dynamic station models in IPS. The possibility of online participation of the dispatcher apparatus in the technological process and the use of the various media of data production should be taken into consideration.

In addition, at the section the results were examined of research on changing the parameters, elements and indicators of the process of rolling stock formation at sorting stations, analysis of the number and length of tracks of sorting and grouping parks and derivation of quantitative estimates of conditions of interaction of technological lines in station parks, increasing effectiveness of dispatcher control under automated operational conditions, optimization of station processes using simulation methods, etc.

At the section "Organization of motion on mainline and industrial transport" methods were discussed of intensifying train operation of sections, improvement of calendar planning of cargo loading according to designations of the sorting station plan, raising the level of routing of unladen wagon flows, determining the needed amount of locomotives for maintenance of routed switching trains in the junction in terms of the dispatcher schedule. Various questions of automation of planning and management of industrial processes at enterprises of industrial railroad transport were examined. Among the problems posed at the meeting, importance was placed on a comprehensive study done at NIIZhT to organize movement of trains according to a graph with intervals reduced to 4-6 minutes.

Participants of the conference approved the results of scientific research performed, and recommended that scientists of transportation higher educational institutions, workers of scientific research and planning organizations, scientific and technical society of railroads, to strive firmly to

achieve an increased efficiency and practical value of the developments. They also urged wider use of computer and mathematical methods in planning and management of the shipment process, optimization of wagon flows and station processes, comprehensive development of throughput of railroad directions and areas, and accelerated establishment of ASUZhT.

REGULATING, IMPROVING PASSENGER TRANSPORT SERVICES

Moscow MOSKOVSKAYA PRAVDA in Russian 17 Sep 78 p 2

[Article by O. Mikheyev: "Regularity and Speed of Passenger Transport"]

> [Text] Raising the level of monitoring and management of the movement of surface urban transport is an important factor in improving services for the public. Solving this task, insuring with high accuracy the regularity and speed of passenger transport is the goal placed before the developers of the automated control system ASU-"Reys" [Automated Management System-"Trip"].

What does the urban transport passenger want? When approaching the stop for a streetcar, trolleybus or motor bus, he wants to be confident that he will leave it no later than an established interval of movement and that he will be delivered to his destination in a certain guaranteed interval of time. To observe with high accuracy the assigned regularity and speed of movement of public transport in Moscow is the task that is on the agenda. The task is unique in the sense that nothing similar to it in scope has evern been decided in world practice.

Our capital has the world's largest passenger transport system. The giant cities of the West cannot compete with it. There public transport has been developed poorly, and the spontaneous growth of private transport has turned the streets into a place of transport congestion and har made the air of the cities almost unsuitable for life. The 10,000 motor buses, streetcars and trolleybuses in Moscow every day transport 9-10 million people, more than 3 billion per year. Such a volume of transport is realized, for instance, by urban passenger transport (including subways) on the whole territory of the Federal Republic of Germany.

With such a scale, to provide the desired regularity and speed of movement of transport by a simple increase in its number means not to simplify but to complicate the problem. Required today is a new quality of management of this whole huge system.

How are monitoring and management carried out now? The driver, as a rule, must register the end of a half-trip (a one-way trip) with the dispatcher at the terminal. If the deviation from the schedule goes beyond the limits of two minutes, the trip is considered faulty. Such control means, first of all, that the dispatcher has limited information about what is occurring on the route, and he does not have the opportunity rapidly to influence the course of events. Second of all, let us be frank, not every dispatcher can withstand the "pressure" of the driver who was responsible for the defect. The bulk of the time and nervous energy goes for mutual explanations, and still the evaluations of the trips sometimes are very subjective. This is not all. The situation on the routes gets more and more complicated, and even with faultless work on the part of the drivers, interruptions of the schedule are possible. The system of traffic control should "liquidate" them: transfer, for instance, vehicles from another route, call out the reserve. Now, however, information about an irregularity in the rhythm can come only from the terminal, at times dozens of minutes later. Until the dispatcher calls "upward" by telephone... If you recall that in the regions of mass construction where the passenger flows are especially intensive, there are not enough telephone lines, the great difficulties in the work of the dispatcher service in many cases will be explained.

The ASU-"Reys" is called upon to put an end to such a situation, to raise traffic control to a qualitatively new level.

"Following a decision of the executive committee of the Moscow soviet this year we should determine the basic principles of setting up this automated management system and prepare the technical assignments for its development," states the chief engineer of the Institute Mosgortransproyekt (Moscow Planning Office For Management of Passenger Transport, Executive Committee of the Moscow City Soviet of Workers' Deputies), candidate in technical sciences B. G. Khorovich. (This planning organization was confirmed as the head organization for development of the ASU-"Reys.") "I can report that the principles of setting up the system have already been defined. It will be based on radiocommunication and will carry on uninterrupted monitoring and management over the route network. The chosen direction makes unnecessary any construction and installation operations on the streets, to digging of trenches, the laying of cables, circuits and so on. To be installed along the route are only indicator-beacons--the simplest radio-transmitting devices. All transport units will be supplied with radio-and electronic equipment. They will periodically (and practically continuously) be 'questioned' from the central dispatcher point. When passing the next beacon on the route, the motor bus (streetcar, trolleybus) automatically registers its code and measures the distance to it from the start of the route. All this information is formed into a 'telegram-response' directed by the motor bus according to the inquiry received to the central dispatcher office. Here the electronic computer compares the time of passage of the 'telegram's' author with the schedule. The result of the comparison is transmitted to the panel in the driver's cab, and he knows constantly if it fits the schedule."

"In this way," B. G. Khorovich continues the story, "traffic management will be continuous and objective, and the driver will constantly receive from the system management actions for maintaining the planned interval of movement. The system will, as it were, lead the driver in the desired regime. It will make it possible even at the stops to install a signal panel where it will show how much time remains until the approach of the coming motor bus."

Knowing the actual situation on all the routes at any moment, the system will offer the dispatcher unlimited possibilities for management of each transport unit, for coordination of actions on the scale of the district or the city as a whole.

"It is very essential," the chief engineer completes the story, "that each motor bus 'telegram' will contain information about the degree to which the coach is filled with passengers. Now in Moscow a complete measurement of the passenger flows is conducted once every 4 years, with the enlistment of a large number of people. The ASU-"Reys" will make it possible constantly to know the degree of the load on the line, and this is the real basis for proper planning of the work of transport and direct management of it. The system will be flexible, capable of rapid adjustment of the schedule in the direction necessary for the population."

The reader may affirm with reason: no kind of system will help the passenger if the fleets put on the routes vehicles that are in need of repair, as still happens, or in a number that is less than what is needed. One cannot help but agree with this. Being worked out in parallel with the ASU-"Reys" and in a version compatible with it is another ASU for motor bus fleets under the name of "TsUP-avtokontrol'" (centralized administration of production and automated management over the release of the rolling stock on line in the motor bus fleet). Microcomputers in the motor bus fleet will keep track of the time for repairs, inspection, and servicing of each motor bus, when it goes out on the line and when it returns to the fleet. They will reflect the true picture of the work of enterprises in comparison with the plan, give exhaustive information about resources on hand, and help to make managerial decisions, reducing to a minimum the disturbances of the regularity of movement on the line. Introduction of the "TsUP-avtokontrol'" system is already underway in the 14th motor bus fleet. Later it will be introduced in all the rest of the motor bus fleets, and also the streetcar and trolleybus fleets of the capital.

When will the ASU-"Reys" start to operate? In the first quarter of next year the Administration of Passenger Transport is instructed to bring to the Executive Committee of the Moscow City Soviet a proposal about step-by-step introduction of the system. In the course of the next year it is planned to equip this system with means of radio communication, which are now being developed by the Moscow Scientific-Research Radio Engineering Institute of Gosatom, and to equip two motor bus routes in the Kalinin district of the capital. The goal is to check the correctness of the principles of setting up the ASU and to test its equipment. After this step-by-step introduction will be started, and it will take, apparently, 3 to 4 years.

An important, large-scale responsible affair has been started. It is necessary to solve a complex of very complicated scientific, technical and organizational questions. There is no doubt, however, that everything will be done for the fastest possible introduction of the automated system. This will help in large measure to solve a problem of important social significance--to improve sharply the operation of passenger transport in the capital.

COMPUTERIZED SHIPBUILDING

Moscow RECHNOY TRANSPORT in Russian No 12, 1978 p 31

YEVTUKHOV, V, Data-Receiving-Computing Center of Glavrechflot, Belorussian SSR

[Text] Control of production preparation in ship repair is labor-intensive and a lengthy process during which a large number of documents are drawn up.

The primary document for production preparation is the repair report which is drawn up on the vessel. It is used to calculate work and analyze overall cost of repair. A vessel is put in for repair several months after it has been drawn up and thus the need always arises for partial change and an additional range of work. These changes reach 50 to 70 percent and the calculations must be redone. In order to complete them in time, technical engineering personnel of various specialties from various divisions are from time to time involved in the accounting work. The use of electronic computer technology can eliminate these deficiencies.

At the computer center of the Glavrechflot, Belorussian SSR, technically justified standards and reference information have been devised: reports of materials and contractor deliveries containing over 6,000 document lines; reports of technological processes and stages of work, including 80,000 document lines; norm setting reports of unit work consisting of over 400,000 document lines.

Input, correction, and storage of norm setting and reference information is done by the Rechflot data base management system (using "Assembler" language). Data processing is done using devised programs (PL/1 algorithm language).

The following problems are resolved in the process of automating control of production preparation for ship repair: formulation of technological order for work performance; calculations of shop and plant needs for labor-intensiveness in specialties and materials for repair of individual vessels; calculations of scarce materials in storehouses, wholesale factory cost of work of the shops and plant on each vessel; price lists of whole factory costs; linear graph of work performance on the ship; production program of shops

and plant on categories of repair and by groups of vessels; calculation of planned need of shops for labor-intensiveness in specialties for performance of the production program of ship repair.

The Unified System 1022 computer, with a minimum assortment of I/O devices is utilized as a technical asset in resolving these problems.

Due to standardization of documentation, unwieldy forms of repair reports have been replaced by the primary document consisting of 2 requisite items (work code and amount). Data of the primary document are transmitted to the Computer Information Center via telephone, telegraph or by radio in 7 to 10 minutes. These documents are drawn up by the command staff for the power-driven fleet; group mechanics draw them up for nonpower-driven fleet on the basis of the "Price List of Wholesale Factory Prices for Ship Repair" which exists on each ship.

Output information obtained from the computer in solving problems in conveyed to the production division of enterprises, where analysis, approval and procurement of the working documents is done. After this, the division sends out procured materials to production subdivisions. Technological orders for work performance enter the shop, production dispatch division and head accounting office. Based on this document, the shops prepare and perform the work.

The calculated requirements of shops and plant for labor intensiveness in specialties enter the economic planning and production dispatcher divisions, the division of labor and wages, and the shops. These data are used for on-line planning, monitoring limits requirements, and management of labor accounting.

Calculated requirements of shops and plant for materials and contract deliveries enter the shop, division of the chief technologist, economic planning and production dispatcher divisions, technical material supply service of the Upper Dniepr Steamship Company. This document is the basis for obtaining materials and monitoring their proper consumption.

Calculation of wholesale factory cost of work is used in economic planning, production dispatcher, and chief accounting divisions.

Calculations of production programs of the shops enter the production dispatcher and economic planning divisions, division of labor and wages, and the shops. On the basis of this document, analysis of possible performance of the program by each enterprise shop is done.

Calculation of production programs of the plant enters the division of the chief technologist, economic planning and production dispatcher divisions, division of labor and wages, shops, and marine management service of the steamship company: this permits analysis of possibilities of the enterprises as a whole.

Data on calculations of planned requirements of the shops in specialized labor-intensiveness for materials and contractor deliveries are used in the work of economic planning and production dispatcher divisions division of labor and wages, shops, and similar data on the planned requirements of the plan, by the division of the chief technologist, economic planning and production dispatcher divisions, division of labor and wages, technical material supply service of the plant, and the steamship company.

The use of a computer to prepare production of ship repairs has reduced the information preparation period from 1.5-2 months to 0.5-0.7 hours, permitting timely monitoring of the production process and more operational influence on its flow.

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CSO: 1863

Abstracts of Articles

USSR UDC 681.3:656.342+656.25-52:656.22.05

LOADING COMPUTERS FOR CONTROL OF TRAINS IN A METROPOLITAN SYSTEM

Moscow ZHELEZHNODOROZHNYY TRANSPORT in Russian No 8, Aug 78 pp 63-65

SHMELEVA, YE. V., engineer

[Abstract] The expansion of metropolitan train systems and the steady increase of passenger mobility have made it necessary to apply the mathematical methods of economics with a computer for traffic control. The main tasks of such a control computer are to take in data on actual train movement and the state of all tracks, to process these data, and to dispatch appropriate commands to all trains in service. Here the computer software is shown, which includes data input, platform and station distribution, and an algorithm. With the official train arrivals and departures schedule as the reference, the computer loading is characterized by the mathematical expectation, the dispersion, and the variance coefficient of processing time within one interrogation cycle. An analysis of data characterizing the Moscow metropolitan train system and processed on a BESM-4 high-speed computer has revealed that one train line will burden an CM-1 control computer with a 10-20 percent load, if trains are to be tracked with a precision within 1 s. An interrogation cycle can be shortened to 15 ms for lines with 12 stations and to 20 ms for lines with 20 stations. It is expedient to process data from several lines in short separate interrogation cycles, within one common interrogation cycle, with a lower than 10^{-4} probability that the processing time will exceed the length of an interrogation cycle. Figures 3; tables 1.

USSR UDC 625.7.033.3

RECORDING ROAD SURFACING DEFORMATION BY MICROCOMPUTERS

Moscow AVTOMOBIL'NYYE DOROGI in Russian No 10, 1978 pp 29-30

LYUBOTA, N. M. and FILIPPOV, V. I.

[Abstract] Recording of pulses from a photoelectric unit of a deflectometer with the use of microcomputer is discussed. The indicator of the movement of surfacing is installed directly at the pavement sagging point. The deflectometer consists of a 2.25 m carbolite pipe. One end of this pipe with adjusting screw for the road rests on a triangular support. The photoelectric motion indicator is located at the other end of the pipe. A motion of the indicator disc is recorded by a photoreceptor where motions are transformed into electrical pulses. Because identical motions produce identical pulses, it is possible to define the full extent of the pavement motion by counting the pulses. A special electrical circuit transforms the input signals from the photoelectro-indicator into appropriate pulses for the microcomputer. This makes it possible to count the number of the pulses from the deflectometer photoelectroindicator and to automate the conversion of the pulses into the extent of the road surfacing deflection (deformation). The microcomputer weighs only 0.3 kg and measures 158x86x36 mm. Deflection of the pavement was produced by an automobile of a definite weight moving with a speed of 2-3 km/hr. A higher speed of the automobile reduces the reliability of results. Figures 1.

USSR UDC 681.322.04:656.212.5

OPERATING EXPERIENCE WITH NAIRI-K COMPUTER IN MARSHALLING YARDS

Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 11, 1978 pp 31-32

DUNAYEV, N. I., chief engineer, Belogorsk station, Zabaykal'skaya Railway

[Abstract] In train dispatching control, train processing and document preparation by technical office personnel were subjected to automation with Nairi-K computers. Because the number of destinations for trains coming into the Belogorsk station of the Zabaykal'skaya Railway is more than 50 percent greater than the number of the trains that are marshalled, sliding specialization of the marshalling tracks and multigroup sectional and combined trains at the track ends were carried out. Trains not assigned to two specific tracks were kept available for multidestination cars to be added, depending on the freight flow capacity and the changing situation

at the station. To accommodate, the model program for the Nairi-K computer was considerably modified. Additional information was entered for each track in the standard routine for maintaining the car accumulation list for each track: weight of freight in each car, car destination code, characteristics of the route groups and so on. Difficulties arise in the double jurisdiction of computers and receiving and transmitting equipment at stations that are very distant from railway computer centers. Also, adapting the Nairi-K program to local train conditions at computer centers or stations often incurs damage to wire insulation in computer tape handling.

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USSR UDC 681.3.06:656.13

PROGRAMMING SOFTWARE FOR AUTOMATED DISPATCHING MANAGEMENT SYSTEMS FOR URBAN PASSENGER TRANSPORTATION SYSTEMS

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 4, Oct/Dec 78 pp 35-38 manuscript received 1 Feb 78

PAVLENKO, G. P., candidate in technical sciences

[Abstract] Automated dispatching management systems (ASDU) for the control of scheduled and taxi urban transportation have been set up in Omsk and Rostov-na-Donu. These systems consist of two parts, the special programs and the operational system. The scheduled transportation ASDU consists of three main (initial start, normal operation and evening shutdown) and one subsidiary (postemergency recovery) programs. The unscheduled (or taxi-type) transportation management system lacks the "initial start" and "evening shutdown" programs (because it is operating on a 24-hour basis) and is also distinguished by the fact that a return from "postemergency recovery" to "normal operation" entails the fulfillment of pre-emergency transportation requests. These systems also make it very easy to obtain statistical data on the functioning of the transportation system. Figures 1.

USSR

FIRST STEPS TOWARD AN AUTOMATED MANAGEMENT SYSTEM FOR MOTOR TRANSPORT

Tashkent EKONOMIKA I ZHIZN' in Russian No 1, Jan 79 pp 54-57

NIYAZBEKOV, SH., deputy minister, Ministry of Motor Vehicle Transport of the Uzbek SSR

[Abstract] Motor vehicle transport has become a mass transportation mode so that hardly any branch of the national economy can function normally without it. It is also one of the first systems using mathematical methods of planning optimization through routing and loading control. A major problem to be solved by an automated management system (ASU) for this industry is to minimize idle travel. In 1978 alone automated management reduced idle travel by 401,000 km with a saving of 56,000 rubles in the city of Tashkent and by 274,000 km with a saving of 30,000 rubles in the Surkhandar'inskaya [illegible] motor vehicle trust. In its second year the ASU is extended to interurban transportation. Into account must be taken the diversity of products trucked, food being particularly critical, and the size of shipments so that maximum ton-kilometer economy can be achieved. Motor vehicle transport is largely involved in grain shipment to agricultural enterprises where, because of seasonal considerations, timely deliveries are most crucial. Here automated management of motor vehicle transport contributes to agricultural output. The computer in the ASU also processes information about vehicle performance and operating conditions, for purpose of maintenance, as well as information fed to the motor vehicle industry for their production planning. One of the next objectives is to optimize transportation of heavy structural loads, another is discrete commercial as well as passenger traffic management. Eventually peripheral equipment will be needed for transmitting and receiving information in a well functioning ASU. So far, however, the All-Union System Completion Trust (Soyuzsistemkomplekt) has failed to provide for this in the budget of the Ministry of Motor Vehicle Transport of the Uzbek SSR.

USSR UDC 658.581:62-50:629.1-43

TECHNICAL MAINTENANCE OF AUTOMATED ROAD TRAFFIC MANAGEMENT SYSTEMS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 79 pp 11-12

MARTYNOV, G. A. and SUMENKOV, S. V., engineers

[Abstract] Periodic technical maintenance of equipment in service is a preventative measure to ensure adequate reliability. Such a maintenance must be adaptive to past and present service conditions, it can be optimized only with actual failure and recovery data taken into account. Here the technical maintenance of automated road traffic management systems (ASU-D) is examined on the basis of 4 years of operating experience in four cities (Moscow, Frunze, Novosibirsk, Kiev). The peripheral equipment is installed outdoors in an urban environment and thus exposed to humidity and dust combined with automobile exhaust fumes. The central equipment is installed indoors. A statistical analysis, assuming a log normal distribution of the maintenance periodicity, yields a relation between the mean failure rates with and without technical maintenance respectively. The results indicate ways to improve the management system performance by appropriately planning the technical maintenance with respect to both periodicity and degree of thoroughness. Because the peripheral equipment operates not only in the coordinated mode but also in the local mode, there is hardly any need for optimizing the concurrence of its maintenance with the overall system maintenance. Figures 2; tables 2; references 2 (Russian).

USSR UDC 681.3:656.254.4/5

INTEGRATED COMPUTER PROCESSING OF DATA ON FREIGHT TRAIN TRAFFIC

Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 2, 1979 pp 51-54

BUYANOV, V. A., candidate in technical sciences

[Abstract] Introduction of the third generation computers on Soviet railroads is discussed. These computers are capable of processing 200-400 operations/sec. with the memory of 512 kilobits on magnetic discs. It is hoped that these computers will be able to: (1) Supply the information on sorting and shunting stations; (2) Automate the management of the assembled trains according to requirements; (3) Compute a day-to-day (for 4-5 hours) plans concerning the performance of sorting and shunting stations, in order to avoid unforeseen difficulties; (4) Organize a data bank on different aspects of the rail-road performance with respect to train traffic, freight movement, number of cars in service and other essential information; (5)

Compute the actual time spent by cars between different stations; (6) Supply information to rail-road customers; (7) Control the movement of individual trains and of the freight (multi-tonnage containers, refrigeration trains, etc.); and (8) Supply the needed information to dispatchers at the rail-road stations. Figures 2; tables 2.

C. Construction

Abstracts of Articles

USSR UDC 69.003:658.012.22

AUTOMATED PLANNING IN STATE CIVILIAN CONSTRUCTION

Moscow EKONOMIKA STROITEL'STVA in Russian No 4, Apr 79 pp 38-39

SHUMSKIY, S. A., deputy chairman of Gosgrazhdanstroya [State Civilian Construction Trust]

[Abstract] Automation of planning is being introduced at 15 scientific-research and design enterprises of the State Civilian Construction Trust (Gosgrazhdanstroya), which includes the Central Scientific-Research Institutes of Experimental Planning for Residential Houses and for Engineering Equipment, respectively, as well as the Kiev, the Tbilisi, the Tashkent and the Siberian Zonal Scientific-Research Institutes of Model and Experimental Planning (ZNIIEP). The automated planning system (SAPR) covers search for optimum mass-planning solutions in the techno-economic and the engineering stages of residential and municipal building projects as well as municipal projects involving water supply, sewers, transportation and other facilities. The system capability includes graphic display of architectural designs, strength analysis, reinforced-concrete design, frame and panel design, roof and arch design, also mold and die design. It produces documentation and blueprints, means of supervision of scientific-engineering as well as constructing-erection activities. The system operates with a computer capacity available to various organizations and institutions, a bank of over 120 algorithms and programs having already been built up. At the present 85 percent of all structural engineering calculations, 30 percent of all budgetary calculations and 20 percent of all equipment engineering calculations are automated, with a cost saving of approximately 400,000 rubles in 1978 alone. A regional network of terminals is now being installed to provide remote field service, while a coordinating council has already been set up to deal with problems of disparity and consolidation.

USSR UDC 69.003:658.012.22

AUTOMATIC PLANNING SYSTEMS IN ORGANIZATIONS OF THE MAIN CONSTRUCTION INDUSTRY PLANNING TRUST

Moscow EKONOMIKA STROITEL'STVA in Russian No 4, Apr 79 pp 39-41

PROKHOROV, D. R., deputy chief of the Main Construction Industry Planning Trust (Glavpromstroyproyekt) at the USSR State Committee for Construction (Gosstroya SSSR)

[Abstract] Scientific research and design organizations of the Main Construction Industry Planning Trust are participating in the development of automated planning systems for institutes (SAPR-PI), with development of both local-purpose and special-purpose algorithms and applied-program packages. SAPR-PI is the highest form of design algorithmization and should yield the greatest effect. It is made available to the Leningrad Construction Industry Planning Trust (Promstroyproyekt) and to the State All-Union Institute for Planning of Special Structures, Buildings and Sanitary-Engineering and Power Installation for Chemical Industry Establishments (Goskhimproyekt) also to the Central Scientific-Research Institute of Steel Construction Planning (TsNIIproyektstal'konstryktsii). Two programs, KARRA and RASK-M, have been developed for automated engineering design of beams (Sterzhen') for static and dynamic loads. Another program, AVRORA, has been developed for optimization of stiffener distributions in flat frames as well as for frame and foundation design. Budgets are laid out by the AVS program. The programming KOMPLEKS-1-76 consolidates most design activities, but is not yet set up to produce final project documentation. Automated design of columns and steel towers has already begun in 1977. At the present a data base for automated planning systems is being developed and computer hardware is being standardized for transition to the Unified System.

USSR

AUTOMATED MANAGEMENT SYSTEM FOR THE KHABAROVSK HOUSING CONSTRUCTION TRUST: CALENDAR PLANNING

Moscow NA STROYKAKH ROSSII in Russian No 4, Apr 79 pp 34-37

LAVRIK, I., deputy chief engineer at Trest Orgtekhstroy (? Trust of Organization and Engineering), Glavdal'stroy (Main Administration for Construction of Enterprises in Rayons of the Far East); and KHRAPAK, A., chief engineer at the Far Eastern Division of NIISistem (Scientific-Research Institute for Automated Systems of Planning and Management)

[Abstract] The first-generation automated management system (ASU) installed for the Khabarovsk Housing Construction Trust has begun to operate at the end of 1977. Calendar planning, i.e., mostly annual but also quarterly and monthly scheduling of technical designs, budgets, material and technical supply, production control and economic forecasts is automated. Some conventional network models of construction projects had been found to be inadequate and were modified so as to consolidate objects without distorting the technological interrelations between construction process components. The computer is equipped and programmed to solve problems variously formulated depending on the target function and the constraints. It can generate plans and select the optimum variant on the basis of given resources and variable deadlines, or generate schedules to given deadlines and select the optimum variant in terms of minimum deficit. The second-generation ASU, whose development was begun in 1978, will provide both more consolidation and better refinement of objects in a network model. There is more emphasis here on production control, involving quarterly and monthly planning, with the aid of a Unified System YeS-1022 computer. Figures 1; tables 1.

H. Supply System

Translations of Articles

ASU FOR OIL SUPPLY ADMINISTRATION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 24 Jan 79 p 2

[Article by A. Minayev, special correspondent of SOTSIALISTICHESKAYA INDUSTRIYA]

[Text] The first unit of the territorial administration's ASU (Automated management system) was turned over for operation at the Gor'kiy Branch of the ASU for Petroleum Supply of Glavneftesnab (Main Administration for the Transportation and Supply of Petroleum and Petroleum Products) of the RSFSR. Specialists have developed eight complex calculating and counting tasks for it. All petroleum-supply information coming into Gor'kiy will now be processed by computer.

The main tasks of the computer are systemization of data and issuing summary documents on the presence of each grade of petroleum products at all oil depots of the administration.

6521
CSO: 1863

COMPUTER MANAGES KHAR'KOV WATER SUPPLY SYSTEM

Moscow PRAVDA in Russian 31 Mar 79 p 2

[Article by N. Lakhno, Pravda correspondent: "An Electronic Dispatcher is Operating"]

[Text] Khar'kov. The distribution of water through the complicated network of underground arteries here has been entrusted to a computer. It precisely detects the city's rhythm and regulates the delivery of water to numerous industrial enterprises and apartments.

A colorful diagram of city water pipes hangs on the entire wall of a large hall at the central panel of the dispatch service. Highly sensitive sensors, located throughout the pipeline network constantly signal data, excess, or low pressure in various sections of the pipeline.

At one edge of the map a red "corner" lights up and an operator turns off an overworked pump. On a green signal the automatic system receives a command to put reserve equipment into operation to provide additional flows of water to a region requiring it.

The automated management system (ASU) for water pipes operates in four large regions in the city, ensuring the proper supply of water to consumers, and its rational distribution during the day. It is not necessary to have excess water pressure in pipes, which leads to breakdowns. A significant number of pipeline network service specialists and workers have been freed. The optimal conditions of pump station last year saved ten million kilowatt hours of electrical energy. The water saved is sufficient to supply the city of 1.5 million people for 2 weeks a year.

A large group of Khar'kov scientists and designers developed and introduced the electronic dispatcher. Work is continuing on the conversion of the entire city's water supply to automated control.

11,574
CSO: 1863

Abstracts of Articles

USSR

GUIDELINES FOR THE DESIGN OF EFFICIENT SYSTEMS

Moscow MATERIAL'NO-TEKHNICHESKOYE SNABZHENIYE in Russian No 12, Dec 78 pp 50-56

NOVIKOV, D., candidate in economic sciences

[Abstract] The information volume of relevance to the State Committee of the USSR Council of Ministers on Material-Technical Supply has increased by 65.8 percent since 1970, and processing it as efficiently as before would require an addition of almost 62,000 persons to the present administrative-managerial staff. Electronic data processing is thus a vital necessity. Here guidelines are established for the design of an automated management system to handle material-technical supply (ASU MTS) which, based on an analysis of factors contributing to its effectiveness and ensuring its correct orientation, essentially calls for letting such a system adapt to realistic rather than ideal conditions. The mathematical model of such a system must accordingly be manipulated so as to account for the mutually interacting socio-economic and organizational-technical factors, by which in turn it also is affected, and must include elements of informal structures rather than depend entirely on the official data structure. This approach is illustrated in handling the transportation problem generally and, more specifically, in the case of coal deliveries from the Donets Basin. The efficiency of such an ASU MTS, which is indeed a complex man-machine system, can ultimately be measured only by the actual economic effect and by its closeness to the original design parameters.

USSR

SUPPLY AND MARKETING UNDER CONDITIONS OF AUTOMATED PRODUCTION MANAGEMENT SYSTEM

Moscow MATERIAL'NO-TEKHNICHESKOYE SNABZHENIYE in Russian No 12, Dec 78 pp 64-68

SAKHAROV, N., deputy director of the Ingulets Ore Processing Combine imeni 50 years of the Soviet Union; and KAGRAMANYAN, E., director of the Computation Center

[Abstract] One of the largest iron ore processing enterprises, the Ingulets combine, is the first one in the Soviet Union to have installed an automated production management system operating by the mathematical methods of economics on a computer and electronic data processing base with a management-engineering backup. There are actually two subsystems here. The first one, "management of material-technical supply," handles incoming and outgoing materials (including fuel) as well as inventory margins and reserves. The second one, "management of finished-product marketing," handles orders and deliveries as well as bookkeeping and shipment. Both subsystems are furnished with appropriate software and peripheral equipment. A cost analysis shows an annual economic effect of 6 percent or 13,900 rubles savings. In addition, five jobs were eliminated. Figures 2.

USSR

THE COMPUTER CHARGES PENALTIES

Moscow MATERIAL'NO-TEKHNICHESKOYE SNABZHENIYE in Russian No 12, Dec 78 pp 68-69

DROZDOV, O., department head at the Republic Computation Center of the State Committee on Material-Technical Supply of the Belorussian SSR

[Abstract] One very effective method of enforcing discipline in all links of the economic chain is to impose penalties for late deliveries. For the metals industry in the Belorussian SSR such penalties were until recently handled by accounting personnel spotwise, in the case of significant delays only. Now this task has been assigned to the "MINSK-22" computer at the Republic Computation Center (RVTS) of the State Committee on Material-Technical Supply, for a more complete and effective handling of this problem. The computer with the proper software handles orders, delivery schedules, production schedules, changes and accounting. The penalties are calculated

following the standard algorithm: zero for on-time delivery of the full amount, according to the terms of the contract, 3 percent of the worth of undelivered goods for the first ten days and 5 percent of their worth thereafter. The computer puts out, in tabular form, three sets of information: 1) Calculated penalty for underdelivery, 2) Actually demanded and imposed penalty; and 3) Undershipment to users of metal products, an item which also serves as a control for checking any discrepancies.

I. Trade

Translations of Articles

USSR

COMPUTING AND DATA PROCESSING CENTER FOR TRADE ORGANIZATIONS IN GOR'KIY

Moscow SOVETSKAYA TORGOVLYA in Russian ("The Helper--Electronics") 31 Mar 79 p 3

MIRONOV, YU., chief engineer of the IVTs, Gor'kiy

[Excerpt] The IVTs [Computing and Data Processing Center] of the Trade Administration of the Gor'kiy Executive Committee of the Oblast Council of Workers' Deputies now serves all of the consumer goods auctions and department stores in Gor'kiy and Dzerzhinsk, the "Prodtovary" Motor Vehicle Factory Association and the storage facilities belonging to "Rostorgodezhda" [Republic Office of the Wholesale Clothing Trade of the RFSFR Ministry of Trade] and "Roskul'ttorg" [Republic Office of Wholesale Trade in Cultural and Sports Goods of the RSFSR Ministry of Trade]. The center's two electronic computers solve 192 tasks each month for these trade organizations.

In the photograph: at the control panel are operator T. Smirnova and engineer E. Kundina, plus Candidate of Economic Sciences S. Nagornaya, director of the IVTs, and I. Bocharov, head of a department.

CSO: 1863

ELECTRONIC COMPUTERS AT THE WHOLESALE FAIR

Moscow SOVETSKAYA TORGOVLYA in Russian No 4, 1979 pp 39-40

[Article by economist E. Zharkov]

[Text] Inter-republic and republic wholesale fairs long ago became the most important form of wholesale trade in consumer goods. A mass of commodities that includes hundreds of thousands of varieties, even under the conditions of centralized resources planning, can be sold only through coordination of a detailed product list and the conditions of sale between the manufacturers and the wholesale and retail organizations.

Demonstration of the technological achievements of Soviet industry at a fair makes it possible to expand the assortment and improve the quality, external appearance and finishing of commodities and to introduce new models.

With each year the volume of wholesale trade at the fair increases, the assortment of goods sold expands and the requirements for their quality are raised. As a result of this a large number of qualified specialists are engaged in the operative processing of daily data on fairs, and then in the course of a long time in the processing of their results. All commercial workers participating in fairs are interested in the rapid processing of information flows. To be oriented toward a wide assortment of consumer goods, one needs to have sufficient and reliable information at hand in a short time. But it is needed above all for control of the fair process.

The contemporary technology of compilation and processing of data on fairs does not permit obtaining in time information on the results of fairs with the necessary details about various indicators. As a result, industrial enterprises do not always succeed in introducing in time correctives connected with demand into production programs before approval of the national economic plan.

The automated system for the processing of data on inter-republic fairs will permit solving the problem of obtaining the necessary data in time. Selected as the first object for the development of the subsystem "Inter-republic fairs," which is a part of the Sector Automated Trade Management System (OASUT) of the USSR Ministry of Trade, was an inter-republic wholesale fair for the sale of leather and rubber footwear.

The technical task for the OASUT subsystem "Inter-republic wholesale fairs" was developed by the VNIIETsistem (All-Union Scientific-Research Institute of the Economics of Trade and Control Systems) with the agreement of Glavtekstil'shveyobuv'torg [expansion unknown] of the Ministry of Trade in 1976 and transmitted to the All-Union Association "Soyuztorgsistema" for development of a standard plan. It is planned to introduce the standard plan into industrial operation in 1980.

However, as early as 1978 in response to numerous requests of Glavtekstil'shveyobuv'torg, the division of economic-mathematical models of the VNIIETsistem assumed a socialist obligation to process the results of the fair on the YeS-1022 computer.

The developers compiled and coordinated with the glavk a unified classifier of commodities, the forms of input specifications and output documents, a technological plan for computer data processing, a program set, methods of monitoring the correctness of filling, etc.

The system obtained is fairly simple and relatively inexpensive, and meets all the requirements of the USSR Ministry of Trade.

For easier transition to automated processing, all the old requisites were retained in the forms and service graphs and coding graphs also were introduced.

Starting 1 July 1978 for 8 days the 1979 Inter-republic Wholesale Footwear Fair was held at the Exhibition of Achievements of the National Economy of the USSR, the 19th, at which the VNIIETsistem jointly with members of the Glavtekstil'shveyobuv'torg staff processed and experimentally recorded data on the course of the fair.

The work was done in the following manner.

At the first session of the fair committee all the participants were warned about the introduction of the new specification blanks, were given examples of a classifier and received instructions on the rules for filling out the specifications.

In the first days, to monitor the filling out of the specifications, answer questions and eliminate difficulties arising at the fair, six members of the institute's staff were present, and later three persons did the monitoring.

The specifications arriving in the course of the day went to the computer center, where copies were made of them (this work required two men in two shifts). The originals of the specifications were returned on the following day, and the copies, after being additionally coded and processed, were punched. The punching required two persons working in two shifts.

As the punched cards arrived they were formed into packages (20-25 cards) and introduced into the machine by an operator.

Unsuitable cards were analyzed by an especially formed group, consisting of three persons. Discovered errors were corrected, and after re-punching the cards were fed into the computer. Thus 18 persons participated in the work in its entirety. At the end of each day the information was printed in the form needed by the fair committee.

However, the first attempt also revealed a number of difficulties. In particular, the commodity classifier proved to be less than optimal in form and did not fully match the assortment of samples presented at the fair. This forced correctives to be introduced into the program while in process.

In the future it will be necessary carefully to refine the classifier and each year before the fair to have it referred to interested organizations for detailed familiarization.

Now, when the efficiency of the system has been demonstrated, the need to make copies of the specifications has disappeared. But the specifications themselves require some refinement. Thus, on the specifications earlier the total sum of the contract was not indicated, and that made it difficult to monitor reliability. Now the specification blanks have been changed to take those requirements into account. Samples of them also must be referred earlier, along with the classifier.

The first attempt to process inter-republic fair data has been positively evaluated by the USSR Ministry of Trade and the fair committee. The further development of automated management systems for wholesale fairs is possible, and this will permit increasing their efficiency and the quality of the work.

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CSO: 1863

J. Agriculture, Water Management, Land Reclamation, Sylviculture

Abstracts of Articles

USSR

AUTOMATED MANAGEMENT SYSTEM FOR FORESTS: SECOND STEP

Moscow ZNANIYE--SILA in Russian No 2, Feb 79 pp 38-40

TEMCHIN, YE.

[Abstract] With the encouragement of Nikolay Reyngol'dovich Gil'ts, director of the Karelian Scientific-Research Institute of Forestry (KarNIILP) in Petrozavodsk, two brilliant men have set up a computer-based automated management system (ASU) for the Petrozavodsk Sawmill and Furniture Combine. The latter has already been operating almost like clockwork under the management of I. L. Tatarko who, after some doubts and much prodding, approved of this idea. These two men are the head of the largest Institute department, Gennadiy Andreyevich Stepakov, and the head of one of its laboratories, Iosif Vasil'yevich Sobolev. While Sobolev, more brilliant perhaps, does the advance work, Stepakov slowly but surely proceeds to implement the goal. The idea is to overcome difficulties in the forest management by converting the economic cycle into a flexible feedback system with a memory which stores all the myriads of survey and assessment data. Anatoliy Ivanovich Shemelin, chief engineer at the Petrozavodsk Plant, strongly favors the ASU but concedes the existence of functional as well as organizational and psychological problems involved with such a changeover. Work continues, however, with more raw data being stored and processed. In fact, the general attitude around has completely changed from reluctance to impatience. Even the next step is already taken, namely a wider adoption of the idea and coordinated participation by the Archangel'sk Central Scientific-Research Institute of Timber Processing Mechanization (TSNIIMOD), the Moscow Institute of Forestry Engineering, and some institutions in CMEA countries. Pictures 4 (taken by A. Zubtsov of the TASS agency and V. Revich).

K. Other

Abstracts of Articles

USSR

COMPUTERS IN PUBLIC DINING ENTERPRISES

Moscow OBSHCHESTVENNOYE PITANIYA in Russian ("Machines Must Help") No 2, 1979 pp 48-49

PIRYATINSKAYA, T., senior instructor, Khar'kov Institute of Public Dining

[Abstract] Prompt record keeping of delivery plan fulfillment and compliance with contractual obligations by suppliers is poorly mechanized in public dining enterprises. Even in centralized bookkeeping offices the stock records are kept at an extremely detailed level so that there are no large discrepancies between retail prices and mean-weighted wholesale prices. Duplication between bookkeeping and stock records are not clarified by cross-checking. Only a few centralized bookkeeping offices have automatic punched-card machines, and computers are barely making a start in this area of trade. This accounting machine shortage makes it necessary to rely not on owned and rented equipment, but on the computer installations of municipal and oblast administrations of trade and public dining, as well as the USSR Central Statistical Administration. Economies in accounting machine processing accounts maintained with the 70-80 percent of suppliers subordinated to public dining administrations amount to close to 50 percent over manual processing costs.

III. SOCIOCULTURAL AND PSYCHOLOGICAL PROBLEMS

A. Education

Translations of Articles

COMPUTER DEVELOPMENT IN BELORUSSIAN SSR

Minsk SOVETSKAYA BELORUSSIYA in Russian 17 Mar 79 p 2

[Article by V. Uryvskiy: "Computer Reserves"]

[Text] Seventy computers--three times as many as in 1970--are now functioning in the system of Minvuz [Ministry of Higher Educational Institutions] of the republic. The stock of computers is increasing rapidly not only in Minsk but also in peripheral academic institutions. For example, the YeS-1022 computer was put into operation at Gomel' State University and at the Novopolotsk Polytechnical Institute.

Saturation of the Vuzes with computer equipment is not a fad, but an objective necessity caused by the high rates of development of higher schools. More than 167,000 students are now studying in 200 specialties in the 31 Vuzes of the republic. More than 11,000 teachers are involved in training them.

The scientific potential of higher schools is great. In the system of Minvuz of the BSSR alone, scientific research is being carried out by 927 departments, 3 scientific-research institutes and 12 problem and 25 regional laboratories. Computers play an ever increasing role in academic and scientific work. Teaching and testing complexes, automated classrooms, student computer centers, laboratories and halls are created on their basis. Seventeen teaching complexes, 132 production auditoriums and 57 automated classrooms operated last academic year in the vuzes of the ministry. A total of 57,000 hours or approximately 40 percent of the computer machine time was expended for academic purposes.

More than half of all the useful machine time is allocated for scientific purposes. Departments far removed from technology--foreign languages, physical education, geography and social sciences--are seemingly manifesting a taste for processing experimental results on computers.

Complication of the solved problems dictates the need to develop an automated management system (ASU) for Vuzes. The Belorussian Technological Institute, which has been entrusted with the duties of a head organization, has already prepared the contract design of an ASU for higher schools. Machine processing of algorithmization of regulating effects will replace the cumbersome manual processing of information documents. Thus, the ASU will relieve the management apparatus of routine duties and will create the principal possibility for more complete fulfillment of analytical functions. Long-term forecasting functions and also operative planning and monitoring the activity of Vuzes will be better utilized. The "Abiturient," "Uchebnyy Kompleks," "Kadry," "Uchet NIR" and other subsystems are now functioning at BPI [Belorussian Polytechnical Institute], BGU [Belorussian State University imeni V. I. Lenin], MRTI [Minsk Radiotechnical Institute] and other higher education institutions. The subsystem "Abiturient" is used at two levels--VUZ-Ministry.

Calculations show that the requirements of Vuzes for computers to support the academic process, scientific work and ASU will increase sharply during the next few years. The deadlines for fulfilling the applications of the departments and laboratories to carry out calculations are already being extended for long periods.

How can this need be satisfied? By increasing the numbers of computers at previous rates? But this is related to many significant difficulties. Problems arise with allocation of rooms, carrying out repair-preventive maintenance and supply with materials and spare parts. One should also not forget the important circumstance of the high cost of modern computers.

It is obvious that available capacities of computer technology must be utilized more fully. The experience of BGU and other academic institutions convinces us of the fact that implementation of a number of technical and organizational measures permits a significant expansion of computer capacity. The university's computer center, for example, supplemented the main set of existing machines with additional devices, created benches to conduct preventive maintenance measures and introduced multiprogram work. The efficiency of utilizing computers was significantly increased as a result.

A progressive operator form of servicing computer users by programs compiled by the teachers and students has been introduced at the Minsk Radiotechnical Institute. Clear organization of the work of the student computer center at the Gomel' State University contributed to improving the quality of performing diploma and course work. The technical and organizational measures implemented by the Vuzes made it possible to increase the use of computer machine time of daytime students from 1 to 1.88 hours and per Vuz worker from 6.6 to 13.8 hours compared to the previous year. Consequently, there are reserves. They must be fully realized.

The technical capabilities of modern computers permit work in the continuous mode. However (and this has been discussed frequently in the press), the Vuz machines have not been provided with staffs of maintenance personnel for three-shift operation. In the given case, the saving in staffs is turned by

unrecoverable losses. One cannot but help to take into account that computer lifetimes are usually limited by obsolescence rather than by physical wear. For example, the second generation of Minsk-2 and Minsk-22 computers is now being replaced by modern computers of the unified series.

Therefore, it is feasible for Gosplan of the BSSR, in planning delivery of machines, to provide allocation of staffs of maintenance personnel calculated for three-shift operation simultaneously with the Minifn [Ministry of Finance] of the republic. In this case allocation of staffs should proceed with some advance of relative periods of machine delivery required to teach the maintenance personnel.

Measures on preparing the rooms, training the technical personnel and selecting the problems to be solved should be timely and completely implemented by the rectors of Vuzes to receive new computers. Unfortunately, this is not always being done. Computers are being put into operation with a delay with respect to the established deadlines at Gomel' State University and the Novopolotsk Polytechnical Institute. Moreover, the Vuzes need modern computers with expanded set of equipment. Delivery of these machines will contribute to more efficient use of electronic technology and, consequently, will have a positive effect on solution of problems of higher schools.

7521
CSO: 1863

Abstracts of Articles

USSR UDC 378.1:681.3

ACCOUNTING FOR THE USE OF BASIC FACILITIES IN A HIGHER EDUCATIONAL INSTITUTE WITH THE HELP OF AN ELECTRONIC COMPUTER

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 4, Oct/Dec 78 pp 11-14 manuscript received 12 Jan 78

BORODINA, A. I. and NEKHOROSHEVA, I. A., candidates in economic sciences, and GOVYADINOVA, N. N. and ZANDER, L. A., engineers

[Abstract] The Belorussian State Institute of the National Economy has developed a program for a "Minsk-32" computer that keeps track of the use of basic facilities at a higher educational institute (Vuz), (which makes it easier to analyze and improve the utilization of both facility and computer time. The program provides for the periodic (weekly, monthly, quarterly, annually) issuing of reports on all facets of facility and equipment use and maintenance. This is done through the input of information from the laboratory equipment use and computer load journals into seven programmed modules. The functions and output of the seven modules, as well as the data they utilize, are described in some detail.

B. Planning, Management and Automation of Scientific Research

Abstracts of Articles

USSR UDC 681.3.068

INTEGRATED COMPUTER SYSTEM FOR GRAPHICAL INPUT AND ANALYSIS OF THE GEOMETRY OF COMPLEX MOLECULAR COMPOUNDS

Novosibirsk AVTOMETRIYA in Russian No 5, Sep/Oct 78 pp 54-58 manuscript received 15 May 78

NIGMATULLIN, R. S. and ODEYANKO, B. N., Novosibirsk

[Abstract] X-ray structural analysis can determine the three-dimensional structure of molecules only when crystalline. Empirical methods are capable of elucidating all the potential conformational variants of a compound. But either approach is very laborious and is not pictorial. A proposed problem-oriented system of graphical input and analysis of the geometry of complex molecular compounds consists of a package of applied programs. The package provides for: 1) Construction of graphical models of molecules and their representation in a variety of media; 2) Input, editing and storage of information about the compound in a specially organized archive; and 3) Topological analysis of the compound. As to software, it is modular and consists of a set of modules and a monitor. All modules in the set can be divided into utilities and problem-oriented software modules. The utilities are a set of auxiliary routines for organizing the functioning of the package of applied programs. Architecturally, the system offers the user two archives: permanent and temporary. The temporary archive is in the fast memory or on the working tape. The permanent archive of the package has a catalog section and an archive section. Each chemical compound in passing through the system can be characterized by a list of constituent atoms, molecular fragments, coordinates of centers of gravity and compound name. As for computer language, either SMOG or GRAFOR can be used without much modification of the package procedures. The equipment is based on a BESM-6 computer, a roll-fed YeS-7052 plotter or a Benson-220 plotting board plotter. As to software, the system was implemented with the Dubna executive system as part of the DIAPAK operational system. The lower level of the system is realized with BEMSh and MADLEN autocodes. The upper level is based on higher-level languages: ALGOL-GDR and FORTRAN. References 9: 5 Russian, 4 Western.

C. Artificial Intelligence

Translations of Articles

THE TALKING COMPUTER

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 7, 1978 pp 45-48

[Article by V. Benediktov, N. Kur'yanenko, M. Chekhovskikh and L. Velitchenko: "Will the Computer Speak?: On Some Psychological Requirements for Oral Output of Information from the Computer"]

[Text] The development of electronic computer technology is headed in two directions: the first is to increase computer productivity by increasing its speed, using multiprogramming, etc.; the second is to simplify man-machine interaction, i.e., to improve I/O devices.

Modern data I/O devices, unfortunately, can still not support the necessary efficiency, reliability and simplicity of man-machine interaction. It has been calculated, for example, that more than 80 percent of all errors of the computer operator are the result of the wrong understanding or omission of incoming information.

What can be done?

As we know, the most popular method of obtaining information is a graphic panel on which the controlled units are depicted and indexes which describe the operating conditions of the device are illuminated. We must note that for modern devices with the enormous flow of graphic panel information, this is far from the best method of presentation. The study of operator eye motion has shown that when it is necessary to deal with only three or four points of information he fixes his glance on 40-60 points.

But it is not only vision that can participate in the control process: there is hearing too. Hearing is virtually immune to adaptation, is more selective to emergency signals and is more reliable under unusual working conditions. Until recently, however, the problem of oral interaction of man and computer was mainly a matter of fantasy, more so than one of science and practice. This is because many attempts at producing oral speech by artificial means fell through. Experts in synthetic speech most often proceeded from the

"part to the whole." After achieving the necessary selectivity of speech sounds, they combined them into syllables hoping to obtain the same selectivity. But the words and phrases composed of discrete sounds were unintelligible. And that is natural. For example, engineering psychology has found that if sample analysis of all syllables is made in a flow of oral speech with high selectivity, only 56 percent comprehension can be achieved, the remaining sounds going uncomprehended. This factor should be taken in the opposite order: if selectivity of a flow of syllables, taken individually, is over 56 percent, the sense perception of this speech fragment is at first encumbered and then impossible. Consequently the whole cannot be built from the parts hoping that the sum will contain something qualitatively new. We feel that we should start the other way around: start with the whole, analyzing its components from the standpoint of those properties and qualities which are accrued by connected speech at a normal rate.

In order to organize spoken "communication" of computer and man, making it worthy not only of science but of industry too, we must thoroughly study the possibilities and outlooks of spoken communication in the man-machine-man system. In a thoeretical sense, this task was taken up by a team of psychologists of the Minsk State Pedagogic Institute of Foreign Languages. For a number of years it was engaged in adapting spoken language for a man-machine system.

This problem is rather complex. The fact is that oral speech differs greatly from written language, not only because it is aurally perceived, but also because its structural and time characteristics are different. Thus written language read aloud can not be considered spoken language.

In order to produce synthetic (artificial) speech as a form of output of data from computer, the specific aspects of oral language in the process of man-to-man communication should be examined and should then be limited with respect to the resources of the computer.

The best utilization of oral speech presumes the ability to flexibly and creatively use an optimally restricted lexicon. If sentences containing up to 250 words may be encountered in written language, this is impossible in its oral form. That phrase would exceed the volume of operative memory of the listener and would not be fully comprehended. Hearing works best with phrases containing five to nine words which are pronounced in a single breath. At the same time, to understand spoken language a sufficient minimum of semantic units must be retained in memory for each unit of time. In the final analysis, the degree of complexity of spoken language is determined by the listener.

Among the distinctive features of spoken language are the following: a phrase is pronounced once, as a rule. This is difficult enough for the listener, because it requires his constant concentration of attention, but hinders understanding of following material. Thus in oral language there are more repetitions than in written language. On top of this, in conversing with someone we speak rapidly or slowly according to whether the listener can understand us or not. In oral language in each unit of time a certain quantity

of information is transmitted, but it is realized alternatively--with respect to the linguistic material and its temporal organization.

All these problems are so complicated that the following conclusion may be made: it is still impossible to create synthetic speech on a par with authentically human speech. For the same reason, there is no need for this. For oral-spoken output of information from the computer we need specific "speech" which differs substantively not only from written language spoken aloud, but also from oral language used in everyday communication among people.

These principles we laid at the foundation of our work. The limitations inherent in oral output of information from the computer were subjected to psychological analysis and thorough experimental study. We first considered the real conditions of perception of special information by the auditory system, since the "human" part of the system determines the resources of the system as a whole. The characteristics of spoken language were derived on the plane of the number of phases, rate of enunciation, intonation, optimum arrangement in the phrase of semantic groups, appropriate reliability and necessary redundancy. It was found that to reproduce ordinary words with their ambiguity and, at times advisable (outside of science) vagueness of meanings, is not necessary in automated control systems operations. The operator needs terminologic unambiguous messages about the "internal" states of the computer, while vagueness in terminology is, on the contrary, extremely undesirable. This greatly simplifies the problem in general, by limiting the lexicon and grammar of communication and giving it the systemic unambiguity of components. But the limitations in no way reduce the complicated organization of synthetic speech, nor the "behavior" of the terms themselves in the phrase. In particular, the enunciation time of a particular term governs the phrase structure as a whole.

The arrangement of semantic groups in the phrase is a complex problem. It is perceived best only in a specific sequence. In a complex series of experiments both the arrangement of terms generally accepted in conversational speech and the specific arrangement--for operators and users of the computer--were established. The latter far from always coresponds to the presumed logical and psychological patterns of thought expression. For example, elements of one and the same message are interpreted differently by programmers and operators of computers. The former are more oriented toward the cause, while the latter are interested in the result. It has been found that cognition by terms in experts has a systemic nature and permits them to more successfully act in response to spoken instructions corresponding to their work activities.

The volume of the phase in oral messages also plays an enormous role in perception of a "talking" computer, since it is directly tied to the enunciation speed. For Russian, Belorussian and other European languages the rate of speed ranges from 240-300 syllables per minute, plus or minus 24 percent. In rapid speech all standards of the spoken language must be observed and, on top of that, it must be structured with a redundancy of linguistic devices.

Understandably, this can not be done with the terminological composition of synthetic speech and the inadequate perfection of its form. The slow rate also had to be rejected, since the artificial nature of its sound was fatiguing and speech turned into a series of terms which the operator then had to try to connect and make some sense of. This way would mean departure from and not approach toward natural speech. For synthetic speech, all test subjects (experts and non-experts) acknowledged a medium rate (220-240 syllables per minute) as objectively best. This suggests that terminological speech, though within extremely restricted limits, can be augmented with redundant linguistic material. This also creates an objective "ceiling" of speech rate due to the impossibility of filling up the eriterminological "void" with superfluous sound.

The rate and terminological nature of computer speech have also predetermined the number of words in a phrase. On the average, phrases were found to contain four to five terms. If the terms are of low complexity, auxiliary devices such as repetition of some of them or inclusion of words which organize attention are employed. But the volume and rate of a phrase must necessarily remain constant.

There is particular interest in pauses in synthetic speech. We have studied them as objective (interruption of sound) and subjective (apparent). So-called positive pauses (real interruption in sound), zero (natural fusion between words in speech flow) and negative pauses (where the end of the preceding word is truncated and in its place sounds the first phoneme of the following word) were experimentally simulated. Functional distinctions of all kinds of pauses are exceedingly interesting. "egative pauses facilitate the production of fused speech. The aspects of "positive" pauses of various magnitude as they affect perception were also studied; when they are increased there are different kinds of effects of supplementary accentuation on the following terms.

The problem of artificial speech intonation is complex. The fact that speech is terminologic, unemotional creates only the initial positions for solving the question. In any case it is necessary to find an intonation which will not cause a clearly negative impression on the listener and thereby hinder his activities. A moderate rate of speech avoids this.

In spoken language the duration of word enunciation corresponds to its rate. If you change it, it displaces these relationships ("speech formula"), but not in proportion (not "mechanically"). In other words, the "speech formula" is reconstructed each time according to the rate of speech chosen. This pattern is impossible to take into account when synthesizing speech from speech sounds. Apparently even here we'll have to go from general to specific.

What limitations, aside from those named above, will be inherent in computer speech? It is apparently voice of emotional coloration (aside from really avoiding negative effects due to total absence), "individual" features associated with temperament and mood, etc. In a word, from the rich, integral concept "human spoken language," on the basis of several substantive features, a new concept is constructed which is just as integral, but is less rich and

more general. A simplification of the problem derived logically and with experimental support, creates a real basis for its solution.

Modern engineering psychology requires the investigator to create real situations. Thus the user first encounters synthetic speech during training. It has two stages: written communication with the computer without participation of synthetic speech and then with it, but without an applied task; the second stage--real activity under the supervision of an instructor (possibly with a redundant system).

Like any complex occupation, the work of an operator with synthetic speech does not exclude preliminary occupational selection. It is essential, for example, how rapidly the operator will react to instructions given orally by the computer. Apparently, a positive indicator is that perception which will be faster and more reliable than written communication with the computer.

"PROMYSHLENNOST' BELORUSSII," No 7, 1978

8617
CSO: 1863

SOLID STATE INFORMATION STORAGE DEVICE ASSISTS DOCTORS

Moscow IZVESTIYA in Russian 4 Nov 78 p 4

[Article by N. Khromova, APN correspondent: "Cybernetic Assistant"]

[Text] Using a laser beam the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences has achieved the densest recording of text. This innovation can find applications in health care.

How many visitors can a rayon polyclinical doctor receive in 6 hours of work? It would seem about 15-20. During this time the doctor must examine the patients, listen to their complaints, become acquainted with analysis, etc. There is a standard questionnaire developed by the World Health Organization. It contains 128 questions to the patient. If it is diligently followed, then it is necessary to spend several hours with each patient.

The Department of Medical Information Systems at the Ukrainian SSR Academy of Sciences' Institute of Cybernetics has created a device which does this part of the section doctors' work. It gives the patient the entire obligatory questionnaire. As a result of the interview between human and machine, the doctor can have, in addition to the given laboratory studies, standardized histories of diseases.

The automated complex interviewer will soon be installed at a polyclinic in one of Khar'kov's plants. In order to obtain exhaustive information on the state of the human organism, specialists feel that it is necessary to have about 100,000 parameters. The electronic memory of the machine helps the doctor acquire the experience of many thousands of specialists. Entering data on the patient into the machine, one can obtain a qualified answer as to how the disease will further develop, what must be done in order to prevent complications, what conditions must be maintained, and what treatment is most effective in a given case....

The Institute of Cybernetics has created an "electronic consultant" for cardiologists, which should help doctors solve problems of restricting the zone of myocardial infarcations. The electronic memory contains not only the experience of well known Soviet cardiologists, but also information obtained from different monographs and articles by prominent foreign specialist.

COMPUTER ASSISTS IN DESIGNING OF INDUSTRIAL ROBOTS

Moscow SEL'SKAYA ZHIZN' in Russian 9 Feb 79 p 1

[Unsigned Article: "Computer Designer"]

[Text] Industrial robots are being more frequently used in production. The development of new methods for designing them will assist in further improving such devices. In order to ease designers' problems, specialists at the Riga Polytechnical Institute have developed a package of mathematical programs. Based on these programs the computer constructs a model of the robot and shows its operations on a video screen. It is thus possible for specialists to compare different variants of the future design. This is especially important at the sketch stage of designing. This method was used by one of the problem laboratories at the institute to make a prototype industrial manipulator.

Scientists at the Vuz are working with the collective at the VEF electrical engineering plant, the computer center of which must model robots with the help of mathematical programs.

COMPUTER CHESS

Moscow SOVETSKAYA KUL'TURA in Russian 23 Mar 79 p 8

[Article by K. Ozerov, Novosibirsk: "Computer, It's Your Move!"]

[Text] A rare opportunity was given to chess fans of Novosibirsk. The "Sovremennik" Studio of Young People's Television Transmissions suggested a chess duel between them and the computer. The television match was played against the Eureka program devised by V. Butenko, associate of the computer center of the Siberian Department of the USSR Academy of Sciences.

While a student of Novosibirsk University he had read a pamphlet "Chess Game Algorithm" by former world champion M. Botvinnik. The ideas presented by the Grand Master attracted the young mathematician: they formed the core of his degree work done under the mentorship of M. Botvinnik. V. Butenko then went his own way and devised his own algorithm.

The Eureka program that he devised took second place behind Moscow's Kaissa computer game: it can not only analyze individual positions, but it can win the match from start to finish.

In view of the first television chess match on television with a computer, our correspondent asked V. Butenko, author of the Eureka program, to answer a few questions:

"Please tell us, does Eureka have its own 'chess handwriting'?"

"I think it does. Teaching the computer to play chess was not the only purpose, but was one way to create an 'artificial intelligence.' In developing chess programs for the computer, most have tried to utilize their ability for rapid choice from among a large number of variants. You might say it is a machine approach, and the sorting method is how Kaissa plays. But man operates differently. After evaluating the situation, he gleans some of the most acceptable moves and then analyzes them in greater detail. That is the approach used by Eureka.

"But it is extremely difficult, of course, to train a computer to do something akin to thinking. Even grand masters still have a hard time explaining why they preferred one variant over another--that is how complicated the process of evaluation and decision making it. Before, when Eureka was analyzing the situation from masters' and grand masters' games, it found the true grand master moves. But it sometimes can win feebly as well. It is now starting to play more evenly, and analyzes those situations in finer, deeper detail. You might say it is taking a strategic approach to the situation."

"How does a game go?"

"In the first game the computer plays white and the opponent plays black. The computer analyzes the situation, selects candidate moves, and then it "calls" what it feels is best. Viewers send in their responses. The most popular of them is selected and is reported to the computer. The moves are made once a week.

"In fact, the game is played--and this is also a distinctive feature of the program--on the domestic "BESM-6" computer. It was supplied for the experiment by the Computer center of the Siberian Department of the USSR Academy of Sciences."

"How long does the computer muse over a move?"

"Each move now takes a bit more than an hour."

Thus the program is now being field tested. After the match, the comments of its television opponents will be analyzed and considered in future work. After all, as the scientists says, he wants to train Eureka to participate in the next championship battle among computers which now occur regularly.

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Abstracts of Articles

USSR UDC 621.501.72

THE POSSIBLE AND THE IMPOSSIBLE IN SIMULATING INTELLIGENCE

Kiev AVTOMATIKA in Russian No 6, Nov/Dec 78 pp 75-82

IVAKHNENKO, A. G. and KOSTENKO, YU. V.

[Abstract] The authors discuss the cybernetic approach to studying intelligence in which the model of thought--artificial intelligence--is a system that can predict short-term human behavior. In the ideal case, the emotions (joy, anger, fear and so forth) will also be simulated. The intelligence of a collective or an entire society of people can be defined in the same "model" fashion. Identity of action of the model and the human being in identical situations is universally accepted by cyberneticists in defining artificial intelligence, but there is some disagreement on whether the algorithms by which the man and the machine behave should also be identical. A comparison is made of the methods of self-organization of the model and the heuristic approach in modeling intelligence. It is experimentally shown that mechanical indeterminate systems such as tossing coins lead to a Pareto distribution region where prediction is not possible. Nevertheless, human activity in the same region can be predictable because of stereotypes (number preferences). This paper was presented at the scientific seminar "Self-organization and adaptive information-control systems" Or'dzhonikidz, 27 May--1 June 78. Figures 9; references 20 (Russian).

IV. NATURAL SCIENCE RESEARCH

A. Biology and Medicine

Translations of Articles

COMPUTER PROGRAMMED TO RECOGNIZE SPOKEN WORDS AND TO SPEAK

Riga SOVETSKAYA LATVIYA in Russian 27 Feb 79 p 4

[TASS Photo Chronicle article: "They Teach a Computer to Speak"]

[Text] Students and staff members at the Scientific-Research Laboratory of Bionics and the Modeling of Physiological Processes in the Department of Biophysics at the State University imeni I. Franko in L'vov are teaching a computer to speak and understand human speech.

Scientists are working on the problem of automatic recognition of audio patterns under Professor M. F. Derkach, doctor in biological sciences.

The laboratory is working on promising developments of systems capable of "understanding" the operator's speech.

Research is being conducted on a spoken dialogue between humans and machines, where a question posed by the operator is answered by a computer printout. Conditions of speech control are studied.

The laboratory is now demonstrating the possibility of synthesizing speech with the help of a computer: the machine answers in a completely understandable "synthetic speech."

In the Photograph, from right to left: Professor M. F. Derkach, laboratory worker at the Department of Biophysics A. A. Strets', and degree holder L. A. Volovnik are studying the spectral characteristics of spoken commands.

B. Other

Translations of Articles

USSR

COMPUTERIZED STENOGRAPHY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Apr 79 p 4

[Article: "Computer Takes Stenography"]

[Text] The State Stenographic Institute in Sofiya has a laboratory like this: "Cybernetics of the Stenographic Process." Three years ago a group of mathematicians, stenographers and stenographic linguists of the laboratory decided to compose an algorithm for the stenographic process. This was based on an idea of L. Andreychin, corresponding member of the Bulgarian Academy of Sciences which stated that analysis of language need not break down written signs into letters, but only into syllables. As a result a mathematical model was devised which showed that it is possible to construct a computer which can be used to print a syllable in a single stroke. Everything else--transposition, word compounding and so forth--can be done by microelectronics.

Thus the MSD-1300 TM stenographic machine was born. Each hand has its own keyboard, slightly inclined and convenient: the stenotypists hands are not strained during work. The new machine can encode and decode information which is then transmitted to buffer memory. The stenographic machine operates so rapidly that any electrical typewriter can not keep up with it if it is connected to print out the decoded text.

V. INFORMATION SCIENCE

A. Information Services

Abstracts of Articles

USSR UDC 621.3.083.92:681.327

DIGITAL INFORMATION DISPLAY

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 4, Oct/Dec 78 pp 50-52 manuscript received 8 Feb 78

TYSHKO, A. I., candidate in technical sciences, SUSIDKO, A. I., MAGDICH, A. V., PETROV, B. A., and SANICHINA, B. V., engineers

[Abstract] The Kiev Institute of Automation has developed a digital information display, controlled by a computer complex, that is suitable for monitoring up to 10 parameters, with each parameter being given in the form of a 5-place decimal number. The device utilizes digital indicator lamps of the IN-12B type, is 606 x 642 x 489 mm in size, and weighs no more than 35 kg. Its maximum renewal frequency is 50 cps and its maximum consumed power is 200 va. This information display has been successfully tested under plant conditions, and its simplicity and low cost make it quite useful in situations where only a small number of parameters need be monitored. Figures 2.

USSR UDC 621.391.18

SELECTING A RATIONAL STRUCTURE FOR A THREE-LEVEL CENTRALIZED INFORMATION TRANSMISSION NETWORK

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 4, Oct/Dec 78 pp 70-74 manuscript received 18 Jan 78

PETROV, E. G., candidate in technical sciences, and BOLOTOV, A. B., engineer

[Abstract] The authors examine the problem of the most rational structure for a three-level [computation center (VTs), switching points (KP) and subscriber points (AP)] information transmission network from the viewpoint of lowest cost. Given two conditions--each AP is connected to only one KP and the KP's are located at the AP sites--they solve the problem in two variants: with and without taking reliability into consideration. They work out two algorithms for the latter variant, one of which yields a smaller number of KP's while the other produces a cheaper network. When reliability is taken into consideration, redundancy must be built into the network. The authors prefer the introduction of additional communication links to the doubling of the network's elements, because it is more economical, and work out an algorithm for optimizing the network. Their program has been used to plan the structure of an information transmission network in Khar'kovskaya Oblast that has 24 AP's. References 5 (Russian).

USSR UDC 681.31:621.3

STRUCTURAL ORGANIZATION OF AN OPERATIONAL DEVICE FOR PROCESSING OF DIGITAL DATA IN THE DECIMAL CODE

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 93 No 1, Jan 79 pp 125-128 manuscript received 20 Oct 78

NATROSHVILI, O. G., SANIKADZE, D. O., DZHALIASHVILI, Z. O. and YASHVILI, N. G., Georgian Polytechnic Institute imeni V. I. Lenin

[Abstract] An operational device with optoelectronic data recording and storage is shown which consists of a counter, a decade adder and a control unit. The structure of the optoelectronic counter consists of a multifunctional module, a conjunctor matrix and a hologram matrix. The structure of the optoelectronic adder consists of n multifunctional decade registers alternating with n banks of a transfer circuit in series with a light emitter, a pulse amplifier, a pulse shaper, a delay line and a photoreceiver. The adder is

tapped at n points for parallel operation. The multifunctional components, containing optrons, simplify the memory structure while also eliminating the need for decoders and indicating devices. The article was presented on 17 Oct 78 by A. V. Chichinadze, corresponding member of the Academy of Sciences (Georgian SSR). Figures 3; references 2 (Russian).

USSR UDC 53.083.8:681.17

CHECKING THE RELIABILITY OF TECHNO-ECONOMIC INDICATORS CALCULATED IN AN AUTOMATIC INFORMATION SYSTEM

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 1, Jan 79 pp 13-15

DEYCH, V. G., candidate in physico-mathematical sciences, and STAL'SKIY, V. V., candidate in technical sciences

[Abstract] One of the main tasks of automatic information systems (AIS) is to calculate the techno-economic indicators of a plant such as its efficiency, consumption rates, material balance factors, energy balance factors, etc. Considering that these quantities are calculated from measured input and output quantities, the mathematics must take into account transducer errors and, accordingly regard the measured quantities as random processes. Here a method of checking the reliability of these calculations is shown, with the mathematical model of the plant assumed to be known and given in the form of a linear stationary system with additive random-noise perturbations. A statistical analysis yields the minimum time interval between measurements ensuring their mutual independence and, for a given probability level, the confidence interval for the random transducer errors in the absence of systematic errors. Applying the rule of three sums, it is then possible to determine whether or not and which transducers are faulty accuracy-wise. For illustration, the use of this method is demonstrated on a typical industrial radial-type suspension coagulator. References 4 (Russian).

USSR UDC 681.3.001.2

TIME REDUNDANCY IN DATA PROCESSING

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 2, Feb 79 pp 12-14

ASHEROV, A. T., candidate in technical sciences, and PAVLOV, YE. A., engineer

[Abstract] Data processing consists of a set of operations performed by technical, antropological (human), or ergotic (hybrid) components of the system, each of them subject to intermittent failure, recovery, catastrophic failure and malfunction. In order to make data processing less inefficient, in terms of lost time and information, there has been introduced the principle of time redundancy to decrease the probability of erroneous and delayed data output. Here this principle is applied to a multipurpose data processing system with automatic control where a spare time is added to each problem solving process and distributed over the various components of the data processing system. The object is to determine the optimum distribution of the time redundancy, i.e., to find the optimum vector with linearly constrained components which characterizes it as the one yielding the maximum probability of undelayed problem solving with an obligatory correction of detected errors. The algorithm is based on probabilities of failure and recovery in the data processing system, the target function being a nonlinear multiplicative one with a single index and maximizable by a gradient-difference method after reduction to an additive one. For illustration, a segment of an automated management system (ASU) is shown which solves problems related to periodic inspection of natural gas extraction and transport activities. After proper distribution of a time redundancy, the probability of undelayed solution of the last problem in a typical sequence has increased from 0.8412 to 0.8569 and the total number of likely errors in the output documentation has decreased from 373 to 221. Figures 2; tables 2; references 3 (Russian).

USSR UDC 681.327.11

DATA TRANSMISSION OVER LOCAL COMPUTER NETWORKS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 79 pp 6-8

BESKOV, B. A., BIRYUKOV, D. V., MAMCHENKO, A. YE., candidates in technical sciences, and BOGODISTOVA YE. S., engineer

[Abstract] Management of technological and production processes or automated planning and execution of experiments involve data transmission in real time over a computer network with peripheral equipment. Essential are selection of the proper transmission mode with the appropriate performance parameters of the communication channel and selection of the coding method. Here pulse-phase-modulation with sequential code transmission in the semiduplex mode over TPV telephone cables is considered for local computer networks with remote terminals. This selection is based on such techno-economic criteria as high speed, high reliability, high noise immunity and low cost. These performance characteristics have been established in series of prototype experiments and the hardware designed accordingly. Figures 5; tables 1; references 4: 1 Russian, 3 Western.

USSR UDC 621:65.011.56:001.2

UNIFIED TECHNOLOGY OF DATA PROCESSING IN AUTOMATED MANAGEMENT SYSTEMS

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 5, May 79 pp 35-37

GRANOVSKIY, A. L., engineer

[Abstract] A forward step in the development of automatic management systems (ASU) is a unified technology of data processing, with both horizontal (intra-level) and vertical (interlevel) integration in real time. Data processing covers preparation of the data base, complex scientific-economic analysis and, on the basis of the results, planning, forecasting and targeting. The technology of data processing by economic-mathematical methods is based on the ASU having a data-algorithm structure and using a classifier of techno-economic indicators as well as a classifier of management functions. The textual part and the numerical part of any indicator can be interlinked either by backtracking of algorithms in a design by simulation, or by sequencing standard procedures and documents. The former approach is "rigid," the latter

approach is "flexible" and thus offers certain advantages in terms of design automation. Also various modes of readout are available, each with merits and drawbacks and thus preferable under different circumstances. The main purposes of the unified technology are to synthesize information so render an accurate reflection of economic dynamics in a given automatic management system, to simulate input and output data fluxes on an indicator level so as to facilitate the solution of administrative problems in real time, to reduce the complexity of special software, and to standardize and automate to the highest possible degree the process of designing ASU. Tables 4.

VI. THEORETICAL FOUNDATIONS

A. Automated Management and Management Systems

Abstracts of Articles

USSR

PRINCIPLES OF ADAPTATION IN AUTOMATED MANAGEMENT SYSTEMS

Moscow EKONOMIKA I MATEMATICHESKIYE METODY in Russian Vol 15 No 2, Mar/Apr 79 pp 345-353

BOBKO, IGOR MAKSIMOVICH, dr in technical sciences, Department head at the Computation Center, Siberian Division of the USSR Academy of Sciences, Novosibirsk

[Abstract] In order to adapt an automated management system (ASU) from one enterprise to another, it is often preferable to subdivide it into levels rather than closed-loop subsystems and thus avoid complex interlinkage in the case of incorrect system breakup. On the first level all problems of software, algorithmization and data maintenance are treated individually. On the second level standard programs of automated management are treated. On the third level treated specific problems and their solutions are treated. The demarcation lines between levels are flexible, especially between the second and the third one. With increasing standardization, both will tend to merge. The "Sigma" ASU, organizational-economic control, of machine and instrument manufacture has already been installed in three enterprises: at the Altayskiy electrical tractor equipment large-scale production plant, at the Barnual radio equipment small-scale and custom production plant, and at the Barnual machine tool mixed-scale production plant. The adaptation here, on the second level, is parametric. An analysis of the system indicates that parametric adaptation alone is not sufficient for an automated enterprise management system (ASUP), that also structural adaptation of the software is necessary with an extension of its functions and with structural adaptation of the data base as well. For minimization of the learning time, moreover, either iterational optimization of the adaptation algorithm or buildup of an additional data file on previous adaptation experience will be needed. Both approaches have advantages and drawbacks. Figures 3; references 4 (Russian).

USSR UDC 331.015.11.001

SYSTEM THEORY AS A BASIS FOR THE DESIGN OF A MAN-MACHINE MANAGEMENT APPARATUS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 79 pp 8-10

YANKO, V. M., candidate in technical sciences

[Abstract] The design of a man-machine management apparatus, the ultimate management system, is approached here from the standpoint of system theory. On this basis, relations are established for the efficiency function, i.e., the set of trajectories of the managed object which characterize the variation with time of its productivity and socio-economic indicators, and the parameters of the production system. Into account are taken the entropy of the production system as well as the functional, structural and informational characteristics of the management system. As a result, it is possible to construct a function classifier for the man-machine management system and with it the functional part of the latter. References 5 (Russian).

VII. GENERAL INFORMATION

A. Publications

Translations of Articles

PROGRAMMING FACILITIES AND DATA ORGANIZATION IN INFORMATION SYSTEMS

Moscow EKONOMIKA I MATEMATICHESKIYE METODY in Russian No 2, Mar/Apr 79 pp 420-421

[Article by R. L. Rayatskas reviewing monograph by Yu. Ye. Stsepinskiy "Programmnyye sredstva i organizatsiya dannykh v informatsionnykh sistemakh," Nauka, Moscow, 1977, 231 pages]

[Text] The book reviewed is mainly addressed experts in the social sciences wishing to become familiar with the basic principles of data processing with the aid of modern computers and the construction of automated information systems (AIS) in the nonindustrial sphere of activities. The small monograph encompasses virtually all problems encountered by planners of information systems and automated management systems (ASU).

In economic and socio-political research a tendency has appeared not only to formulate complex computer problems, but also to organize analytical and synthetic data processing on computer in wide scales.

Under these conditions the assimilation of methods of planning AIS becomes especially important. The book also contains a coherent presentation of these methods.

Two trends have become delineated in the elaboration and incorporation of ASU and AIS. The first is the creation of ASU at enterprises and industrial associations using standard planning solutions and elements, where the planning and incorporation of the ASU is actually placed on an industrial basis. The second is an increase in the number of assignments of a most diversified nature and methods for their solution, a scope of new levels of the national economic hierarchy going beyond the nonindustrial sphere. Therefore the importance of standardization in planning ASU and AIS is without doubt.

In developing specific ASU and AIS, these tendencies make it necessary to account not only for the information requirements of the particular user, but also for the actual resources of programming and hardware whose use is being assumed in the planning solutions of the given system. Both the user and the systems developer must know what standard elements of the planning solutions exist and are suitable for the selected range of problems. Parametrization of elements of planning solutions simplifies the choice of standard solutions and planning elements and reduces system hook-up time.

The goal of parametrization of elements of planning solutions in the book is defined as a guarantee of the possibility of properly formulating the assignment for elaboration and of organizing the process of planning and incorporating the ASU and AIS according to the end-purpose equipment and resources. Thus a revelation of the chief principles of parametrization of planning solutions and elements of these systems is proper, based on the structural diagram of the basic parametrized features of the problems of planning and management proposed in the book for computer solution, and the establishment of a methods diagram of analysis of information elements, and later on, their substantive parameters and characteristics. This allowed the book's author to propose a complete and logically straightforward classification of planning solutions, a common list of technical, functional, cost, and special parameters of elements of ASU and AIS, as well as generalized indicators of quality and characteristics of development of these systems.

Modern methods of evaluation of ASU and AIS make it possible to determine, as a rule, their economic effectiveness, operational qualities and efficiency of use of a computer system. But the enormous practical value of the AIS is the evaluation of the effect of development and use of this system on an organization which it serves. A list of alternative hypotheses is given with respect to the possible effect of an automated system on an organization in which it is incorporated; the basic methods and devices for obtaining and analyzing initial data according to the evaluation of this effect are given.

In parametrization of constituents of program-software used in AIS, the author specified two groups of parameters. The first group contains indicators which define functional schemes of problem solving from the viewpoint of effective (in terms of reaching the goal) construction of discrete subsystems and the system as a whole; the second--describes the effective organization of the computing process and the technological scheme of data processing in AIS.

In using a third-generation computer to construct ASU and AIS, a particularly important role is played by internal software, the core of which is the operational system. In the book its parametrization is described in terms of functional and operating features on the basis of a list of possibilities suggested by this system to the user. Regardless of the type of operating system, its parameters are evaluated as a means of: 1) Realization of planning solutions within the given automatic information system; 2) A guarantee of effective programming, check out, and utilization of programs; and 3) Implementing efficient organization of AIS operation as a whole.

At present there are no sufficiently reliable methods for cost evaluation of programming devices, especially for the technical and programming basis of the third generation. The book considers the primary factors affecting the cost of programming, such as those defined by functional requirements for software and the volume and technology of work, technical programming basis, and organizational factors. The author cites a useful method of calculating time for programming and specifically illustrates evaluation of its labor-intensiveness as applied to each discrete problem in elaboration of AIS.

Characteristics of data base management systems are given for various user categories: those implementing a maintenance formulation of problems in terms of an occupational problem system; planners of information systems used in planning standard elements; programmer users directly communicating with the data base control system to create problem programs which form the automatic information system; and administrators responsible for organizing utilization of data base control systems within the system.

In view of the fact that there is no domestic systematized experience in the use of third generation computers, there is significant merit in examining typical examples of planning solutions in the field of programming devices for information systems from foreign practice. The book describes the IMS all-purpose data base control system developed on a hardware and software base of the IBM 370 family, the SESAM information systems for formatted data processing, and the GOLEM nonformated data processing system developed on a hardware and software base of the Siemans Systems 4004. The basic characteristics of technical means and methods of selecting hardware/software basis for construction of AIS are quite fully elucidated.

In approaching the problem of evaluating the quality of a computer system, each AIS planner finds it necessary to tie this evaluation together with his own specific requirements for problem solving. This is not only because of defined conditions of solution of a specific problem, but also with organizational factors. The author describes features and major parameters considered in selecting a computer type and discovering the necessary configuration of equipment with the appropriate software to create a purposeful AIS.

A significant place is given to a general description of the basic methods of computer evaluation and appropriate software (methods of instruction mixes, modular programs, analytical models, complex natural tests, synthetic programs, simulation). Furthermore, recommendations are given to the use for choosing methods of evaluation of indicators of the hardware/software base for the corresponding AIS.

Highly effective organization of operations of modern computers and their link with several remote is achieved by means of remote processing. The book describes hardware and software and operating conditions of remote processing systems. Furthermore, a series of time-sharing computer center networks in the US are examined: ARPA, CYBERNET, MERIT, TSS, TUCC, and INFONET. Brief data on two AIS in West Germany are given.

The book stresses the great practical value of organization of data preparation for input into the AIS. Classifications and a clear description of elements of data preparation systems are given: carriers, assemblers, preparation and transmission media. Significant place is given to functional, technical and cost characteristics and parameters, which form the basis in selecting or comparing specific data preparation devices. Because of low efficiency of data preparation media, input into the processing system is a key problem with high computer productivity.

The appendix contains brief descriptions of the most typical foreign data preparation systems: DEOS, manufactured by Siemens (W. Germany); Inforex 1301 (USA), MDS (USA), SYCOR-340 (USA); they may be useful in developing technical specifications for planning and choice of similar technical media in our country.

On the whole, the freshness of the material presented by the author and saturation with facts should be noted. This work is not a guidebook for planning specific information systems (such work will probably never be written due to the diversity of problems of EDP), but its value is in its attention to those important items which must be known to everyone who is involved in experimental problems and intends to plan an information system.

The book will be a good aid for planners of AIS and ASU. Experts in social sciences, as potential users of such systems, will get a rather complete picture of the expenditures and limitations involved in formulating problems, preparation of initial information, forming specifications for development and planning automatic information systems and organizing computer centers.

Although this study is intended for developers of ASU and AIS in the nonindustrial sphere and experts using computers to solve information analysis problems in the social sciences, it will certainly be interesting and useful for experts in other fields.

The monograph could be a little shorter and could do without the introduction and first chapter. In citing the example of increased labor intensiveness of programming (chapter two), the author remained silent on the definition of the volume of programs (page 62). It should be indicated that in this case the volume is calculated in terms of the number of computer instructions in the program. The book would be even more useful if the author would have shown means and forms of construction, within the same number of pages, of information analysis systems to solve even a limited range of specific problems of a socioeconomic nature.

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